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PUBLIC HEALTH:

A

POPULAR INTRODUCTION

TO

SANITARY SCIENCE.

BEING A

HISTORY OF THE PREVALENT AND FATAL DISEASES OF
THE ENGLISH POPULATION FROM THE EARLIEST
TIMES TO THE CLOSE OF THE WAR OF THE
FRENCH REVOLUTION IN 1815.

BY

WILLIAM A. GUY,

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FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
PROFESSOR OF HYGIENE IN KING'S COLLEGE, LONDON;
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&c. &c. &c.

HENRY RENSHAW,
356 STRAND, LONDON.

1874.

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TO

ROBERT CHEERE, Esquire,

MEMBER OF THE COUNCIL OF KING'S COLLEGE, LONDON, AND TREASURER OF
KING'S COLLEGE HOSPITAL,

THESE LECTURES ARE DEDICATED

AS A TRIBUTE OF SINCERE ESTEEM AND AFFECTIONATE REGARD

BY

THE AUTHOR.



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PREFACE.

THE eight lectures I have so recently delivered at King's College are here printed, somewhat condensed, but otherwise little altered.

In compiling them, as in printing them, I have been actuated by the belief that the Science of Hygiène is imperfectly appreciated, because some are ignorant, others unmindful, of the rich benefits it has lavished upon us in times past. I have accordingly endeavoured to remove the existing ignorance or indifference by submitting the facts of the case in such a form that they may commend themselves to the members of my own profession as true and yet not trite ; to the public as interesting in themselves, and supremely important in their practical applications.

The title I have adopted indicates of itself the wish by which I have been actuated to combine a scientific with a popular treatment of my subject. Whether I have succeeded in so difficult an undertaking must be left to the judgment of others.

In treating my subject after the historic method, I wish it to be understood that I have chosen rather to present a connected series of faithful abstracts of the chief works of our great sanitary historians and reformers, with facts and

figures taken direct from the London Bills of Mortality, than to settle disputed questions by weighing one authority against another. I must also state that, in omitting minute references to authorities, I have been solely influenced by the wish to fit my work for continuous uninterrupted reading. Nevertheless I believe that the chief sources of the information I have brought together and condensed will be found sufficiently indicated for every useful purpose.

If I may be allowed to commend one lecture rather than another to the attention of philanthropists and statesmen, it is the seventh, in which, as I believe, I have rightly estimated the character and works of John Howard.

Let me add that, for the reasons assigned, I have wished to place in the hands of the public a cheap and attractive volume; and that in that wish I have been well seconded both by publisher and printer.

26, GORDON STREET,

May, 1870.

PREFACE TO PART II.

THESE four Lectures on War in its Sanitary Aspects are an expansion of the three which I delivered at the College of Physicians in the year 1871, and they were themselves but a continuation of the eight Lectures given at King's College the previous year. In order of time, as in mode of treatment, the second course of Lectures was a fitting sequel to the first, and accordingly I have numbered and paged them so that when bound together the two series shall together present a "History of the Prevalent and Fatal Diseases of the English Population from the earliest times" to the end of the War with France which terminated in 1815. To give completeness to the joint work, I have prepared a copious index of the contents of the twelve lectures, and have added what I think will prove acceptable to many Students of Sanitary Science, a list of the books that I have quoted or used.

And here I have to acknowledge in a very special manner my obligations to the admirable papers of Mr. Hodge, a former President of the Institute of Actuaries, on the Mortality of the Army and Navy, and to thank Dr. Graham Balfour for several useful hints and suggestions.

The four Lectures now published will be found to contain more than one Sanitary episode written after the

Preface to Part II.

model of those contained in the earlier course. To the accounts then given of the Devonshire Colic, the Small-pox at Blandford, and the outbreak of Mania among overcrowded pauper children ; of the Plague in London and at Eyam ; of the Fire of London and its effects, the projects of Wren and Evelyn for rebuilding the city, and the attempt to ventilate the House of Commons ; of Anson's Voyage, and Captain Cook's Services ; and of the Grand Sanitary Reforms of Howard and Jenner ; I have added a similar account of Lord Howe's victory of the 1st of June, of the Campaigns of the Peninsula and Egypt, and the expedition to Walcheren ; of Dr. Brocklesby's extempore Hospitals ; and of Ambroise Paré's singular reform in the treatment of Gunshot Wounds.

Of these recent episodes I may venture to repeat what I had already said of those contained in my earlier lectures, that they have been carefully compiled and condensed from the original documents, and that they will be found not the less adapted to popular teaching, that they are as accurate in their statements as I was able to make them.

To those who aim at imparting popular instruction in Schools, whether for children or adults, to soldiers and sailors, or to working men in town or country, I trust that I may, with some confidence, recommend these Episodes of the grand Sanitary History of England.

26, GORDON STREET,

December, 1873.

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LECTURE I.

INTRODUCTORY.

THE Council of King's College in the exercise, as I think, of a very wise discretion, have determined that henceforth Hygiène, Public Health, Sanitary Science, shall be duly honoured within these walls. They have accordingly founded a Chair of Hygiène; and have appointed me their first Professor. I am very sensible of the honour; I recognise the responsibility, and I will strive to justify the choice.

Need I say that I do not handle this subject now, either as learner or teacher, for the first time. My interest in it dates back more than a quarter of a century. It began at a time when sanitary science, legislation, and organization were in their infancy; so that if some exotic pestilence (such as the cholera) landed on our shores, or some home-bred epidemic (such as typhus fever) scattered sickness and death among us, we were taken by surprise: we lacked everything needful—legal authority, a centre of intelligent guidance and control, a staff of officials. But happily, we were not equally destitute of facts; for the Registrar-General had been for some time at work, heaping up materials to serve as the bricks and hewn stones of a scientific edifice, and furnishing periodical returns which had a direct practical value, both through the interest they created and sustained, and the wholesome warnings they administered.

When I say that, at the time to which I refer, the science of Hygiène was in its infancy, I do not mean to

assert that we had no knowledge of preventible causes of disease and premature death, or to ignore all that the eighteenth century had taught us about the lead colic, the scurvy, the jail-distemper, and the small-pox. Nor do I overlook the fact that *La Médecine Légale*, and *L'Hygiène Publique*, had been treated by Foderé and others as parts of one larger and more comprehensive science in which the State had a special interest; that Paris and Fonblanque, in treating of Medical Jurisprudence, had something to say about the "preservation of public health," about nuisances, plague-police, and bills of mortality; and that we were not without able treatises on such special topics as the influence of employments upon health. But Hygiène had not then grown to the perfect shape and full stature of a science. It was not fully displayed in any treatise, or set forth in any recognised and authoritative course of lectures.

Again, I do not speak of sanitary legislation as non-existent, but as inefficient. If a neighbour stopped some "antient light" or corrupted the air "with noisome smells," a man had his remedy in an action at law; and from very early times, he had a chance once a year of bringing some common nuisance under the notice of the *Court-leet*. But efficient sanitary legislation there was none. And the same may be said of sanitary organization; for the officer of health was then known only in Ireland, as the legislative offspring of the inquiries of the Select Committee of the House of Commons "On the State of Disease and Condition of the Labouring Poor in Ireland," embodied in the Reports of 1819. A quarter of a century was to elapse before the "large towns and populous districts" of England were to be submitted to a like scrutiny, with a like practical result. It was in 1844 that the Commissioners appointed to conduct that inquiry presented their first report; and towards that report (monument as it is

of the sagacious and well-directed industry of Mr. Edwin Chadwick) I contributed the results of a laborious inquiry into the health of letter-press printers, and of others following in-door occupations. This inquiry taught me that a great saving of life might be confidently looked for in an unexpected quarter: that out of 36,000 deaths a year in England and Wales, which I attributed to true pulmonary consumption, 5000 might be saved by increased space and improved ventilation in shops, workshops, and factories; that among men doing the same work under the same roof, the liability to consumption was determined by the space; and that this might be narrowed to a point at which men would die as fast as by some contagious malady, so that here, as in Italy, consumption might seem to pass from one person to another.

Such being the result of my first sanitary inquiry, it was but natural that, without disparaging the art of healing, I should come to think with Foderé, that it is in the power of governments to do more good to mankind than all the books on medicine put together, and be ready to co-operate with those who felt that a "Health of Towns' Association" ought to spring out of the startling revelations of the "Health of Towns' Commission." Accordingly, from 1845 to 1848 (when "The Nuisances Removal and Diseases Prevention Act" was passed), by lectures, by speeches, by printed appeals, and by all the legitimate machinery of a wholesome and successful agitation, I bore my part in that labour of love. With the first sanitary Act to show as the fruit of its efforts, the Health of Towns' Association soon died a natural death; but the interest which it had excited and sustained did not die out. There were still whole bodies of men and women, such as the London bakers and the needlewomen, suffering grievous physical evils which no existing legislation could alleviate or remove; and our soldiers were victims of a sanitary

neglect both cruel and costly. There was still, therefore, a work of wholesome agitation to be carried on; and in this, too, I bore a part. The interval between the eventful year 1848 and the present time has been filled by a series of researches on the Influence of Occupations on Health, the Duration of Life among the higher and middle classes, the Dietaries of Prisoners, the Mortality of Hospitals, the Fluctuations of Mortal Maladies, the Relation of Insanity to Crime, and several other topics directly bearing on the Science and Art of Hygiène.

This brief retrospect will not, I trust, be condemned as egotistic. It was not unnatural, I think, that the first occupant of a new Chair should desire to justify the choice which has placed him in so distinguished a position.

To these few words which, counting on your indulgence, I have ventured to say about my own sanitary work, I desire to add, that if at any time during the last quarter of a century—at the beginning of it, when the subject wore the blush of novelty, or, more recently, when that attraction had ceased—I have been impressed with the importance of sanitary science, that feeling has been confirmed and strengthened by every inquiry into which I have been led during the preparation of this course of lectures.

Brought, so to speak, into close contact with the great pestilences of the Middle Ages—with the Black Death of the fourteenth, the Sweating Sickness of the sixteenth, and the Oriental Plague of the seventeenth century—I found the historians who recount their ravages profoundly impressed with their social and political consequences. Hecker, the learned author of the “Epidemics of the Middle Ages,” finds in the Black Death “the greatest impediment to civilization within the memory of man”—“One of the most important events which have prepared the way for the present state of Europe;” our Professor of

Economic Science and Statistics attributes to it nothing short of "an economical revolution" here in England; and historians of repute have attributed the decline and fall of the Roman Empire to the pestilences which swept off the adult male population, and left the then proud mistress of the world an easy prey to the barbarians.

But these opinions, though they served to confirm my first impressions of the great importance of Sanitary Science, did not take me by surprise, for I called to mind the confident statement of Sir Gilbert Blane, that if the mortality of the British Navy during the war with America had obtained throughout the French revolutionary war, our stock of seamen would have been used up, and "men would not have been procurable by any bounties, however exorbitant." So that it was not the seamanship and fighting qualities of our sailors alone that carried us triumphantly through that terrible contest, but a reduced mortality due to the sanitary discoveries and reforms which first recruited our population by saving lives in infancy and childhood, and then cut off from our forces by sea and land, the destructive supplies of jail-fever, scurvy, dysentery, and small-pox.

I feel, then, that we are dealing with a subject, the importance of which it is impossible to deny and difficult to exaggerate. Let us look closely into its aims and scope, the sources of the knowledge it accumulates and applies, the scientific methods it employs, its past triumphs, its future prospects.

The aim of Sanitary Science is to prevent disease, preserve health, and prolong life—to maintain the whole people in the highest efficiency for the labours of peace or the struggles of war. If we prefer the term *Hygiène*, we may divide it into two branches—a *private hygiène* if we address ourselves to individuals, a *public hygiène* if we deal with nations or communities.

It is of public hygiène that I am to speak in this course of lectures; and it is a very large and comprehensive science. It has to do with persons of every rank, of both sexes, of every age. It takes cognizance of the places and houses in which they live; of their occupations and modes of life; of the food they eat, the water they drink, the air they breathe; it follows the child to school, the labourer and artisan into the field, the mine, the factory, the workshop; the sick man into the hospital; the pauper into the workhouse; the lunatic to the asylum; the thief to the prison. It is with the sailor in his ship, the soldier in his barrack; and it accompanies the emigrant to his new home beyond the seas. To all of these it makes application of a knowledge remarkable for its amount, and the great variety of sources whence it is derived. To physiology and medicine it is indebted for what it knows of health and disease; it levies large contributions on chemistry, geology, and meteorology; it co-operates with the architect and engineer; its work commends itself to the moralist and divine.

The Council of this College have always acknowledged this its moral and religious aspect; and from the first establishment of the Theological Department, have arranged that its pupils should not leave this place ignorant of the fact that the destitution which attracts disease repels religion.

Among our *sources of knowledge* there are two to which I must make special reference. I mean the past history of disease, and its current history as displayed in the periodical returns of the Registrar-General. Of its history in times past, I may observe that it is in many points of view extremely important. It teaches us that several fatal epidemics, some imported, some bred at home, have ceased to afflict us because we have relinquished the habits of life that welcomed or produced them; that some eu-

demic maladies have nearly disappeared with a wider and better cultivation of the soil, and others with the spread of commerce, and the increase in the number and variety of our articles of food ; while, in one instance at least (I speak of the lead colic), much suffering has been averted, and many lives saved, by inquiries conducted on the soundest principles of induction ; and in one ever-memorable case (vaccination), by closely observing nature, and listening to the voice of analogy. These historic retrospects, full, as they are, of instruction and encouragement, cannot be disregarded in any systematic course of teaching.

The current history of disease is equally indispensable, not merely as a means of comparison by which the past becomes more instructive, but as indicating, at short intervals of time, the exact state of the public health. Nor must we forget that these very reports, so valuable at the time of their publication, are to become, in their turn, materials of history, and standards of comparison indispensable in all inquiries into the sanitary state of any class or group of persons, of any village or district, of men or women following any given occupation.

And now, having said something of the aim and scope of our science, and something also of our sources of information, I proceed to inquire by what methods of procedure we transmute it into scientific truth ; how we become possessed of those general principles which we hold in reserve, to be applied at a moment's notice to such special cases as may present themselves.

To answer this question, we must first inquire to what class of sciences this science of ours belongs. Obviously to the same class as medicine itself. Both are pre-eminently sciences of observation, with much in common, and many points of contact ; both make disease their study, but in different ways. With the physician the

question is, What will cure an ague, or mitigate a fever? with the health officer, What will prevent them? If the physician takes cognizance of prevention, it is only to advise the patient and his household what precautions they should adopt; but the care of the officer of health extends to the whole district or community threatened by the disease. The physician may advise a consumptive patient to abandon some unhealthy occupation, damp dwelling, or undrained district; the officer of health would render the occupation healthy, or drain the district dry. Medicine studies climate, in order to learn how it may suit a case of asthma or consumption; *hygiène* inquires what effect it is likely to have on a fleet or an army. In a word, while cure or palliation is the aim of medicine, prevention is the object of *hygiène*; while the one studies the good of the unit, the other looks to the welfare of the mass. And this consideration leads us straight to the point at which we are aiming—the nature of our scientific methods. As *hygiène* deals with mankind not one by one, but in masses, its scientific method can be no other than that numerical method so often confounded with its leading application—statistics. If this word now meant what it originally did, and what, I think, it ought still to do—the science of States—then *hygiène* would take rank among its leading subdivisions as applying the great State-policy of prevention to health and disease.

Of this numerical method which the French physician Louis so largely applied, and Gavarret so ably explained and illustrated, I have now to treat, as it lends itself to the science of *hygiène*, premising that under the mistaken name of statistics it has been the subject of many a pleasant jest, and freely admitting that it is an instrument of danger in the hands of the ignorant, the awkward, or the careless, though safe and sure in the grasp of the honest and intelligent. Every honest man finds it a friend;

to the man who prefers the triumph of an opinion or a party to the truth, to him alone is it an enemy.

The precautions to be observed by those who make use of this powerful instrument of research are many, and not always obvious. They do not lie on the surface, but crop up at every turn. With each fresh inquiry they present themselves afresh; with each new science they change their form and character. I will illustrate these precautions and the application of the method as I have found it in the act of giving birth to great hygienic discoveries. Be it, however, well understood that this logic of large numbers is itself subordinate to a universal logical method which deals with sums and averages no otherwise than with individual facts, or with the results of experiment; indeed with all data, whatever form they assume. So that the instances I am about to adduce must be taken as illustrations both of the numerical method and of this more comprehensive logic. They all belong to the sanitary history of the eighteenth century, and are taken from the works of Sir George Baker, who is not generally numbered among hygienic authorities.

1. Quite early in the eighteenth century, certainly prior to the year 1703, there prevailed in the county of Devon a disease of which the first and usual manifestation was a painful colic, the second a paralytic dropping of the hands; while, in rare instances, the sufferers became delirious or epileptic, and died at length convulsed or comatose. Cases of this disease were so numerous in Devonshire and so rare elsewhere, that both the inhabitants and the physicians who wrote about it agreed in regarding it as an endemic malady. They also saw that a disease so prevalent and yet so local must needs have a cause both widely diffused and limited in the extent of its operation. The cyder made and consumed in the county answered to this description, and was accepted as the true cause. Mus-

grave, who wrote in 1703, and Huxham in 1739, adopted the popular belief, and differed only as to the particular property in the cyder which gave rise to the disease, the one ascribing it to its crudity and sharpness, the other to the tartar it contained. Huxham's tartar theory was the more plausible of the two, for it seemed to link together, as due to this cause, the colic attributed alike to the wine of Poictou, the rum of Jamaica, and the cyder of Devonshire. But Sir George Baker, who had long doubted this theory, thought he saw, in the symptoms of the Devonshire disease, the working of the poison of lead; and he deemed it eminently improbable that two things so unlike as apple juice and lead could give rise to the same symptoms. Lead, then, being such a poison as would account for all the symptoms of the disease, Sir George will go in search of it, expecting to find it in some shape or other in the cyder. But first he will do justice to an anonymous French author, who seems to have anticipated him; and he will also ransack ancient Greek and Latin authors in search of information about lead and its effects. Then, returning to Musgrave and Huxham, he shows that crudity and sharpness in liquors is productive rather of diarrhœa than of the constipation that attends the colic; while tartar shares with acid liquors the power of curing it; and that the wines of Poictou, when the disease prevailed in that part of France, were adulterated with litharge: and he cites a happy illustration from Zeller which (like a two-edged sword) cuts both ways, to the effect that the inhabitants of the neighbourhood of Tübingen drank with impunity wines as sour as vinegar, till they came to be adulterated with lead, and that then the colic showed itself. Sir George next shows that the Devonshire colic is most prevalent when cyder is most abundant; that it attacks persons of all ranks who drink it, but that, as Dr. Wall, of Worcester, tells him, the cyder-making and cyder-drinking inhabitants of Hereford, Glou-

cester, and Worcester, do not suffer. He now submits several specimens of Devonshire cyder to chemical examination with others from Hereford; and finds lead in the former, not in the latter—indications of lead and the metal itself; lead from cyder in the cask, lead from cyder in bottle. The next step is to discover the source of this lead impregnation; and he traces it to a practice almost peculiar to the county of Devon, of mending the stones of the presses with iron cramps, fixed by melted lead; to another practice of lining the presses entirely with lead; to another of nailing sheet lead over cracks; to another—namely, the use of leaden pipes to convey the juice from the presses; to another, to wit, the putting a leaden weight into the casks to prevent the liquor growing sour; to still another—namely, boiling the must in vessels deepened by a rim of lead. Add to this employment of lead in the making of cyder, what was probably too largely practised, the use of it and its salts to correct acidity, and we are at no loss to account for the prevalence of the colic and its attendant paralytic and nervous disorders throughout the length and breadth of the county of Devon. On the other hand, Dr. Wall, of Worcester, alleges that the freedom from colic in the counties of Hereford, Gloucester, and Worcester was coincident with the absence of lead from their cyder-making apparatus.

The number of persons suffering from this unexpected cause must have been considerable; for in a period of less than five years, ending with 1767, 285 cases were received into the Devon and Exeter Hospital, of which 209, or about three in four only, were cured. The more obstinate cases were sent to the Bath Hospital, and of these about half were cured. Of the patients, it appears that Devonshire contributed eight for one from the counties of Hereford, Gloucester, and Worcester. The colic therefore was not confined to Devon; but existed to a limited

extent in the other cyder-making counties ; and cases are reported by Wall and others, to show the exceptional use of lead beyond the limits of Devonshire. One of Dr. Wall's cases is to the following effect : " In a plentiful year of apples, I knew a farmer who, wanting casks, filled a large leaden cistern with new cyder, and kept it there till he could procure hogsheads sufficient to contain the liquor. The consequence was, that all who drank of it were affected by it as lead workers usually are. We had eleven of them at one time in the infirmary."

Sir George Baker's masterly demonstration of the true cause of the Devonshire colic is contained in the first of the seven papers which he read at the College of Physicians in 1767. The remainder in part confirm and justify his views, and in part enlarge and complete our knowledge of the poisonous action of lead, and of the many unexpected ways in which it may gain admission into our bodies. It is not possible to read these papers without being struck with the rare union of learning, industry, candour, and logical acumen which they display ; and no one who is acquainted with Dr. Wells' Essay on Dew, so generally cited as a model of scientific research, can fail to recognise in Sir George Baker's essays logical illustrations of equal value, with the additional recommendation that they issued in a great discovery by which an immense amount of suffering has been averted from mankind, and no small number of lives saved.

2. But Sir George's papers on the colic of Devonshire and the poison of lead are not his only claim to a foremost place among sanitary authorities. In the year 1782, he read to the College of Physicians " An Account of a Singular Disease which prevailed among some Poor Children, maintained by the parish of St. James, in Westminster." This essay, as you will presently see, is not only a most valuable contribution to our knowledge of

the baneful consequences of overcrowding, and of the physical causes of insanity, but also an excellent illustration of the use of the numerical method, and of a mode of discovering truth which confers on observation the force and value of experiment.

In the autumn of 1782, 73 healthy paupers (46 girls and 27 boys), from seven to fourteen years of age, were transferred from Wimbledon to King Street, Golden Square. On the fourteenth day after their arrival, a girl, thirteen years old, was suddenly seized with excruciating pain in the stomach and back, soon followed by violent headache, *delirium*, and convulsions—for which symptoms she obtained temporary relief. After a few days, another and another girl were attacked exactly in the same manner, and at the end of three weeks, the disease had become so prevalent that Sir George was called in. He found nine girls and a woman servant ill; five in “extreme pain,” three “cruelly convulsed,” and two “raving in a fit of *delirium*.” Another woman servant “was tormented by a severe colic.” He was told that some of these patients had had several attacks, and had been relieved by purgatives; but that the last two days the attacks had been more violent, the intervals of ease shorter, and the delirium almost incessant. Sickness was a leading symptom, and constipation general; and in three cases a spontaneous vomiting and purging had given immediate and permanent relief. The patients sometimes lay quiet for one or two hours, and then started up screaming. They themselves stated that their fits began with transient pain of stomach, followed by pain at the back of the head, and this by “total perversion of the understanding.” “None of them had any degree of fever.” The worst attacks followed sleep. Four or five other girls had complained of pain in the stomach and bowels. This strange malady affected only females, was

confined to those who had slept in the same room, and of these to such as were above thirteen years old. The house, being mostly wainscoted, had been painted a month before the children came to it, and the smell of paint was still very perceptible everywhere. The sleeping-room occupied by the sufferers was 8 ft. high, 20 ft. long, and 16 ft. wide, and held 10 beds; 9 for 18 girls, two in a bed, and one for the servant; but being a warm room, it "was generally crowded at night by a much greater number than its just complement." Counting the woman as equivalent to two children, the cubic space per child would be only 128 feet. But, to make the matter worse, "the chimney had been stopped up with bricks," and it was the "constant custom of the servant at night to keep the room shut, and to close the window-shutters." The parish doctor, who often had to visit this room at midnight, found "the smell of paint very disagreeable." The three candles and oil-lamp were observed to give a glimmering light, and to be "frequently almost extinguished." A woman who had passed one night only in this room, as nurse to the sick children, had, next morning, a sharp attack of the same pain, delirium, and convulsions. But, strange to say, of 18 girls who slept in an adjoining room of the same dimensions, painted at the same time, but having an open chimney, not being so closely shut up at night, and not so attractive to outsiders, not one had a symptom of the disease. The diet and treatment of the children was the same throughout the house, and was deemed satisfactory. The patients were removed to a large airy room. They passed a quiet night, but next morning were seized in the usual manner, but the fits were less frequent, less violent, without convulsions, and there was an abatement of the delirium in the intervals. Things went on well for four days, but on the morning of the fifth Sir George found all the patients,

“after having passed many hours in pain and convulsions, in a most outrageous state of insanity, which continued the whole day.” From that time, though all the patients had several returns of pain in the stomach and bowels, it was less severe, was rarely followed by convulsions, and seemed to change its seat to the lower bowel, creating tenesmus and dysuria. During the whole course of the disorder, whilst there was a remission of colic and convulsion, there were “pains in the breast, legs, and arms.” No fresh seizures took place after the sleeping-room was evacuated. No death happened; but in two instances the recovery, though complete, was very slow.

This case presents us with those conditions of equality (in locality, in size of apartments, in number of occupants allotted, in the recent use of paint, in diet and general treatment, in the sex and age of the sufferers) for which science is ever on the look out; while it brings into bold relief the excess of crowding and exclusion of air as the concomitants, and most probable causes, of the bodily and mental disorders; as either the true and sufficient cause, or as joint causes with the emanations from the painted walls. But on this latter supposition, the paint must have been innocuous under the less unwholesome condition of the room, the occupants of which remained unaffected.

But whether this most curious combination of intestinal, nervous, and mental disorder is to be regarded as the result of intense pollution of the air from overcrowding and utter absence of ventilation, or of these co-operating with the emanations from the walls, I esteem it one of the most instructive contributions yet made to hygiene on the one hand, and to psychology on the other; and withal as an admirable example of the most fruitful in good results of all our logical methods.

3. I take my last illustration from Sir George Baker's

“Observations on the modern Method of Inoculating the Small-pox,” read to the College of Physicians in 1771. It is very interesting at the present time, when the question Where shall we treat patients suffering from contagious maladies? is exciting so much interest.

I may remind you that when our great physician Sydenham began to practise, more than two centuries ago, the medical world was divided into two parties, of which the one advocated bleeding and lowering remedies, “to check the too great ebullition of the blood,” the other “as strenuously insisting on the necessity of cordial medicines, and a very warm regimen, in order to imitate nature, and to expel the malignity of the disease from the centre of the body to the circumference.” “Sydenham was persuaded that a great number of patients had fallen victims to both heresies.” But that which he attacked with the greatest success was the last; and after a hard fight with doctors and nurses, he dealt a deathblow to the stifling system. But there is a strange vitality about great errors; and so this false theory of the seventeenth century survives in this enlightened nineteenth, under the modified form of a partiality for close-fitting doors and windows, a horror of drafts, and a proneness to attribute every natural change for the worse in the condition of a patient to some innocent movement of fresh air. Dr. Pultney, of Blandford, whom Sir George, in the language of his time, styles “a very ingenious physician,” relates “a fact notorious in that place,” which ought to serve as a corrective of such notions.

On the fourth of June, 1731, a fire broke out at Blandford, when 150 persons were ill of the natural small-pox. All these were carried instantly into the fields, where many remained several days and nights. Beds were laid for them on the dry ground under hedges, and the arches of bridges; “yet notwithstanding this sudden ex-

posure to the air, it is a fact which many people will remember and can testify, that one person only died—viz., a young woman who was almost expiring at the time when she was removed.”

These 150 cases, be it recollected, were cases of *natural*, not of *inoculated* small-pox, and that of a severe type; for we learn from Dr. Pultney’s letter that small-pox of so malignant and destructive a kind was then prevailing in the West of England, that Dr. Andrew of Exeter lost in eight months 25 patients in 44 from the natural disease confluent with purple spots; and he was credibly informed that at Lyme 60 deaths at least had occurred among about 250 people: also that of the few seized at Blandford before inoculation a great proportion died under very malignant symptoms. Now the natural small-pox of which these patients died under very malignant symptoms, the small-pox which at Exeter had killed more than half whom it attacked, and at Lyme nearly one in four, broke out in Blandford the first week in April, at which time there were at least 700 inhabitants who had not been inoculated, and such “a perfect rage for inoculation seized the whole town and neighbourhood,” that by the 16th of the month about 300 had been operated upon, and that without any preparation. Now the mortality from the inoculated small-pox, when imparted to persons of all ages without special preparation, amounted to about 1 in 500; and Sir George tells us that, according to the best information he could procure, about 17,000 persons had been inoculated after proper preparation, and with subsequent free exposure to the air, and that of this number only five or six died. Such being the favourable rate of mortality in inoculated small-pox, let us see what happened to the inoculated at Blandford. We are told that there were in the town many advocates for the warm regimen among all ranks; that “the hot regimen was too

much practised in several instances," and that when Dr. Pultney "was called to some of the people," and witnessed the giving of "hot things" during the eruptive fever, but especially "the pernicious custom of depriving the sick of the benefit of fresh and cool air, he did not wonder that miscarriages should happen"—the miscarriages in question being thirteen deaths in 384 cases!

Here then we have the inoculated small-pox (naturally a mild and tractable disorder) claiming thirteen victims out of 384, or more than one in thirty, under the hot regimen; while, in the same town, the natural small-pox, of a severe type, and elsewhere killing from a fourth to a half of all whom it attacked, destroying only one person in 150, and that one already on the point of death, under the very cool regimen of hedges and dry arches.

I may take this opportunity of stating that, about a century ago, Dr. Brocklesby, an army surgeon, showed the advantage of treating typhus fever in rude temporary structures, such as we may burn down when they have done their work without scandalizing the most rigid economist. But my present object being to show the application of the numerical method and the all-embracing rules of logic to the discovery of truth in Hygienic Science, I rest content with these illustrations from the works of Sir George Baker, and pass on to consider past sanitary triumphs, and the hopes they seem to justify of progress in the future.

Now there are three diseases which no longer, under any name, figure on our registers of death: I mean the Black Death of the fourteenth century, the Sweating Sickness of the sixteenth, and the Plague of the seventeenth. For the disappearance of these diseases neither science nor the labours of individuals, nor such local occurrences as the Great Fire of London, can claim any credit. We must attribute the happy result to the natural progress

of society from barbarism to civilization, to the onward march of the peaceful arts, and to the growth of habits of decency and cleanliness.

But there were still in existence, in the first year of the eighteenth century, several fatal maladies destined to become extinct, or to suffer material reduction in the number of their victims, by discoveries and successful sanitary labours made and undertaken in the next hundred years,—diseases of the earliest infancy, which I shall not stop to particularize; diseases of childhood, divided into two groups of infectious disorders and wasting maladies; and those of manhood, divided into the same two groups.

Of the first class I will simply observe that they certainly destroyed fewer lives at the end than at the beginning of the century. If I were asked for a rough estimate, I should say that for 3 deaths of infants at the beginning of the century there were 2 at the end; and this improvement too, like the passing away of our early epidemics, I attribute to progressive civilization, more skilful medical treatment, and less ignorant nursing. Perhaps I cannot better exhibit the improvement that took place in the second half of the century than by giving you the figures of the British Lying-in Hospital for the first and last twelve years of that period of fifty years. There died in the first twelve years more than 1 in 15: in the last twelve, less than 1 in 82! And, as I have before me the deaths of the mothers for the same years, I may state that, while the death-rate for the first twelve years was 1 in 38, it was only 1 in 318 for the last twelve. These figures show a reduction of mortality in an institution which must have commanded the best medical skill and best nursing of the whole period under review, of more than fivefold for children, and more than eightfold for their mothers. In this reduction sanitary improvements in space, ventila-

tion, and cleanliness must have borne a very considerable part.

Respecting the infectious diseases of childhood—scarlatina, measles, whooping-cough, diphtheria, to which I may add small-pox, as less exclusively a disease of childhood—I must speak with some hesitation, as the old London bills of mortality do not admit even of a rough comparison with the reports of the Registrar-General under this head. But that there was a great falling-off in the deaths from the chronic wasting maladies of children during the eighteenth century admits of no manner of doubt. Heberden, comparing the figures of the London bills for the beginning, middle, and end of the century, shows that out of about 21,000 deaths at each of the three periods, scrofula, or the evil, occasioned 70 in the first, 15 in the second, and 8 in the third; and rickets 380 in the first, 11 in the second, and 1 only in the third.

Turning now to the adult population, and to the diseases most amenable to hygienic treatment, we find unmistakeable evidence of improvement. Fevers, which are held to be specially open to the attacks of the sanitary reformer, are set down by Heberden as destroying 3000 persons, most of them probably young adults, in the beginning, 3000 in the middle, and only 2000 at the end of the century: and dysentery as falling from 1100 to 135, and from 135 to 20! I find too that from 1701 to 1758, the entries in the bills under the head of sores and ulcers and imposthumes fell from 113 to 23. I mention these three entries—fever, dysentery, and ulcers—because these, with scurvy and small-pox, were the scourges of our seafaring population in the times to which I am referring. Of the small-pox, let me add that it was credited with 1600, 2000, and 2000 deaths in the beginning, middle, and end of the century.

Among the diseases that destroy the young adult popula-

tion, pulmonary consumption must always hold the first place; and this disease is set down in Heberden's tables as the cause of 3000 deaths at the beginning, 4000 in the middle, and 5000 at the end of the 18th century. I cannot now discuss the causes of this increase; but must devote what remains of this lecture to a short notice of the three diseases to which the events of the 18th century have imparted a special interest—*scurvy, jail-fever, and small-pox.*

The history of the scurvy is a history also of scanty or improper supplies of food. In early times it followed as a mortal epidemic in the footsteps of famine, being promoted, but not caused, by cold damp seasons, and by squalor and filth. It is commonly found associated with dysentery, fever, and foul ulcers, and has certainly contributed largely to the fatality of our great epidemics. The progress of agriculture and horticulture, our enlarged commerce in fruit and vegetables, the abundance and cheapness of the potato, and improved habits of life, have done much to root out this destructive disease from among the civil population.

Through the combined operation of these causes the scurvy long since ceased as an epidemic, to reappear in connexion with such visitations as the potato rot in Ireland; in young communities, such as California, before the introduction of a due supply of vegetables and fruits; in workhouses and prisons whenever the potato (the only or chief vegetable element in their dietaries) is omitted. But when the scurvy had ceased to afflict nations and communities as an epidemic, it did not cease to scourge their armies and fleets if their supplies of food fell short, or the essential element of fruit and vegetables was cut off from their dietaries. In earlier times it was but natural to suppose that the disease was occasioned solely by want of food, and not by the absence from such food as starving people

could obtain of the vegetable element. At what period the truth dawned upon men's minds we do not know; but certainly as early as 1617, John Woodall, Master in Surgery, knew that lemon-juice was the best of all remedies for the scurvy, and commended it accordingly. But strange to say, this important fact was forgotten or overlooked for more than a hundred years. About 1770 Lind revived and diffused a knowledge of it. But nearly another quarter of a century was to elapse before our navy was supplied with it. This important step was taken in 1796, and was probably determined by a fact that occurred about two years previously. The *Suffolk*, of 74 guns, sailed from England the 2nd April, 1794, with a supply of lemon-juice, of which two-thirds of an ounce was given every day to every man on board. This ship was 162 days without communicating with the land, and reached Madras without losing a man, with only fifteen slight cases on the sick list, and no case of scurvy.

In my sixth lecture I shall give you in detail the facts of Anson's disastrous voyage, that you may be able to appreciate the possible ravages of the scurvy; and, by way of contrast, some particulars of Captain Cook's first voyage round the world. In this place I must content myself with stating that in less than nine months Anson lost 626 out of 961 men, chiefly by scurvy, being nearly 2 in 3; while Captain Cook, about thirty years later, sailed round the world, and returned in three years with the loss of four men by accident and one by disease, out of a crew of 118. Again, in Parry's three Polar voyages, of a year and a half and two years' duration, only 7 men died out of 334.

Making the largest allowances for the difference between the man-of-war and the exploring vessel, and between the modes of recruiting in the two cases, we have yet an excess of mortality in Anson's vessels which proves the great efficacy of the measures for preserving health

for which Captains Cook and Parry were so justly renowned. The demonstration of the possibility of preserving the health of seamen in long voyages is an honour which has been specially ascribed to Captain Cook, for reasons which I shall explain in my sixth lecture.

The jail-distemper is an old offender. The famous Black Assize was held at Oxford in 1577. In those early times it was known as the *Sickness of the House*. I think I recognise it in the London bills from 1606 to 1665 as the *Parish Infection*. It was still at home in the prisons of England during the first three-quarters of the eighteenth century, and John Howard, in 1774, found their inmates expiring in loathsome cells of pestilential fevers and the confluent small-pox. It was one of the most loathsome, infectious, and fatal diseases of which we have any knowledge. A prisoner might carry it about with him in his clothes, and, "invulnerable in his own mephitic atmosphere," infect the whole court convened to try him; might convey it, if discharged, to his own family, or to the population of a village or town; might become a terrible focus of infection to armies or fleets. It originated among prison scenes in which it is hard to say which was most conspicuous, the disgusting filth, the reckless depravity, the lawless violence, the gross imposition, or the helpless inaction of the State. One cannot think of it without horror, or speak of it without disgust. Such a combination of physical and moral evils, such a seething mass of crime, misfortune (for most prisoners were small debtors), low vice, and debauchery, the world has never seen beyond the limits of England. I am speaking of a date as recent as 1774. Then it was that "plain John Howard," "modest, noble Howard," of whose gentleness, courage, and constancy I shall have to speak in my seventh lecture, finding that, as Sheriff of Bedford, he had a duty to perform, did it, as was his wont; and after such a fashion, too, that in the self-same year

1774, he compelled the House of Commons, by the force of his facts, backed by the weight of his personal character, to release the prisoner from his fetters of physical corruption and illegal extortion. In a few years the jail-distemper died out from English prisons, washed and blown away; and a fatal source of infection was for ever removed from our civil population, a constantly recurring danger from our army and navy.

The only remaining disease that I have to notice is the small-pox, a fearfully contagious and most destructive malady, scarring and blinding where it did not kill, the associate of the jail-distemper, one of the many foes of the soldier and sailor. It might be rendered, as we know, a very mild disease by inoculation, introduced into England in 1721; but practically the reduction of mortality due to this cause was not very considerable. It was Jenner's discovery of vaccination, about 1796, that gave us the means, if we had been wise enough to use it, of stamping it out. How much it has already done for us we all know. Its triumphs are inscribed on our mortuary registers, in the small population of our blind asylums, on the unscarred faces of our men and women, in the reduced mortality of our soldiers and sailors.

If what I have said of the labours of Cook, Howard, and Jenner be true, then it must follow that the joint results of their benevolent and wise exertions may be found inscribed in the plain language of figures on our public records. I take the mortality in the navy as my test, and I find the figures for the two periods 1779 and 1813 to stand as follows:—1779, 123 per 1000: 1813, 14 per 1000. In 1779, one man sick in every two: in 1813, one man sick in every eleven! These are strange and startling figures; but they do not come by surprise on the minds of those who are familiar with the writings of Pringle and Blane, of Lind and Howard. They know

full well that whereas before the days of Cook, Howard, and Jenner scurvy, jail-fever, and small-pox robbed us of many a victory, and inflicted upon us many a cruel disappointment, it was with the soldiers and sailors whose health these men had protected, whose lives these men had saved, that we gained the victories, by sea and land, of the terrible war of the French Revolution. These three men indeed were "more than armies to the public weal." They were our safety in times past; they will be our boast, our exemplars, our encouragement, in all times to come.

If you are not quite weary of figures I will ask you to note and remember these dates:—Sir George Baker's demonstration of the true cause of the Devonshire colic, 1767; Captain Cook's first voyage, 1772; John Howard's parliamentary triumph, 1774; Edward Jenner's boon of vaccination, 1796! Is it necessary that I rehearse the names of the great men who were in the prime of their lives in this interval between 1767 and 1796, who were born to us here in England or in our colonies between the birth of Howard in 1726 and that of Jenner in 1749 (or say, the thirty years from 1720 to 1750); need I specify the names of Clive, Franklin, and Washington; of Paley, Blackstone, and Adam Smith; of Herschel and Arkwright; of Burke and Fox; of Goldsmith and Cowper; of Reynolds and Gainsborough; of Haydn, of Wedgewood—in order that you may feel how glorious, how rich in all that makes a nation great, was this thirty years of the eighteenth century, in which Baker, Cook, Howard, and Jenner displayed their talents and their virtues? It was a grand epoch in a great history; the dawn of practical Hygiène; the sunrise of preventive philanthropy. Am I wrong in thinking that there are many in this room who would like to know more of the sanitary history of this eventful time, more of the men who unconsciously laid the foundations

of the science and art of hygiène? In the last four lectures of this course I hope in some degree to gratify this wish; and next year, if life and health are spared me, to treat of the diseases and sanitary discoveries and reforms of this 19th century.

Time will not permit me to say all I could wish on a part of my programme that is still untouched—I mean the prospects of this our science of hygiène. I would not willingly exaggerate them: but when I bear in mind that we have only lately discovered that our drinking-water may become a vehicle for the poison of cholera and typhus, and that pulmonary consumption is amenable to the influence of drainage; when I reflect that there is great room for improvement in the management of all infectious maladies; that most of our towns and all our villages are still untouched by the hand of the sanitary engineer; that a great work of cleansing has yet to be done in all our rivers and streams; that there are swamps and marshes still undrained—when I bear all this in mind, I cannot condemn as extravagant the estimate of those who think that a fourth part of our actual mortality may be ultimately averted. Nor, if the question of ways and means must be entertained, can I overlook the fact that large sums of money are being wasted, and worse than wasted, on wilful destitution, and a vast taxation of some seven millions a year squandered on the ever-recurring, never-ending work of palliation, which sums, if they were devoted to the work of prevention, would soon make England the healthiest and the happiest, as she is already, in spite of reckless waste, rash speculation, and spasmodic schemes of emigration, the richest country in the world.



LECTURE II.

THE BLACK DEATH.

FROM the tone and tenor of my first lecture I think you will infer that I am deeply impressed with the importance of my subject, and desire to commend it not merely to my own profession, but to all who take an interest in great public questions. I want to realize for myself, and impart to you, the grand progress we have made in health, and in all the decent and wholesome usages, all the unobtrusive virtues, which cluster round it, whether as its causes or consequences, from the days when the Black Death, the Sweating Sickness, or the Oriental Plague laid their heavy hands upon us, to the close of the eighteenth century, when Scurvy, Jail-distemper, and Small-pox were added to the list of extinct pestilences. If I wanted any justification for addressing, in this my first course, not my medical brethren only, but that larger public also that takes an interest in great social questions, I should find it in the fact that while we owe the prevention of small-pox to the science of Jenner, we trace the destruction of the jail-fever and the abatement of the scurvy to the shrewd common sense of two men, Howard and Cook, who did not enjoy the advantage of a medical education.

I think you will also infer, from what has gone before, that I propose to myself an historic treatment of my subject, by which I do not mean a minute quotation of authorities, but rather a series of analytical sketches drawn direct from the works of authors of repute, or based on

such data as the London bills of mortality. And where, as in the case of John Howard, I find a great character, as I think, misunderstood, I shall blend biography with history, and present the man himself, attended by his works; nor shall I fail to speak of Captain Cook when I treat of the scurvy, or of Jenner when I discourse of vaccination. I need scarcely add that it is of the sanitary history of *England* that I propose to treat. Of other nations I shall speak only incidentally and briefly.

In treating a subject historically, it is desirable to divide the whole period under review into shorter periods, defined by certain salient events. Now, the health history of England, up to the close of the eighteenth century, may, I think, be distributed into three periods, as follows:—

I. From the earliest time to the middle of the fourteenth century, the epoch of the Black Death.

II. From the middle of the fourteenth century to the year 1666, the date of the Fire of London.

III. From the year 1666, to the end of the eighteenth century.

The first period is marked by scanty records of frequently recurring epidemics; the second by the occurrence of the Black Death, Sweating Sickness, and Plague, concerning which we possess fuller details; and the third by the great discoveries and reforms to which I referred in my first lecture, in connexion with the names of Baker, Cook, Howard, and Jenner.

I shall devote the rest of this lecture to a brief notice of the first period, and to a short account of the Black Death, the first of the three epidemics of the second; my third lecture chiefly to the Sweating Sickness; my fourth wholly to the Plague; the last four to the prevalent and fatal diseases of the eighteenth century.

But before I enter on this retrospect of the first period,

I must prepare the way for the better understanding and full appreciation of it by a few observations on Health and Disease ; on *health*, that you may feel its importance, on *disease*, that you may know what I mean when I come to speak of its several forms and varieties.

I know that I speak the language of commonplace when I say that health is the greatest of blessings, the mainspring of bodily strength and mental efficiency, and the prime source of comfort and enjoyment ; while disease, in proportion to its degree and duration, is synonymous with suffering more or less severe, and failure more or less complete. But I think that I rise above the level of commonplace when I seek to draw some distinction between the value of health to different classes of society. To the rich, who need not work, and to the poor who must, health is equally the source of comfort and enjoyment ; but to the man who must labour that he may live, health is this and something more. It is the means by which he earns his living. Disease, and especially such a lingering malady as a fever or a consumption, dries up the sources of his subsistence, exhausts his savings, plunges him into debt, threatens him and his with destitution. If he recover his health, he may have lost his occupation, and must spend his convalescence in a wearisome, perhaps a fruitless, search after work. If disease attacks his family but spares himself, it is still the greatest calamity that can befall him and them. The minor household virtues have no worse foe, education no deadlier enemy, intemperance no more sure ally, than sickness when it invades the humble dwellings of the poor.

Now let us consider what disease is in its relations to the State. Labour and capital may be said to be the two pillars on which it rests. Disease paralyses labour and wastes capital. In nations that make public provision for the poor, preventible disease and premature death impose

the heaviest taxes on the rate-payer, so heavy that in one instance, cited by the late Dr. Southwood Smith, no less than 13 out of 15 of those who received relief in one district of the metropolis had been ill of fever, or were pauperized by it. This, in a greater or less degree, is the sure result of all severe and lingering diseases. But this is not all. The State must have soldiers and sailors in peaceful times, and must add largely to their number in time of war. In either condition disease is very costly; but in war, as I showed you in my first lecture, it may be supremely disastrous. In such facts as these we have the strongest motive to study disease, especially in its preventive aspects.

That we may enter with advantage on this study, we must first realize the complex and variable character of all the elements with which we have to deal—of the population subject to disease; of the circumstances which prepare it to succumb or resist; of the atmospheric states which favour the rise and spread of it; and of the causes which directly produce it.

To make these matters clear, I will suppose that on the first day of some year (say this very year 1870) we have under observation a population of 4000 souls in some district of this great city. This population will consist of men, women, and children of all ages, from the child just born into the world to the centenarian on the point of leaving it; of every constitution and degree of vigour; of every grade of mental power from idiocy to genius. All these were but the survivors among many germs of life, of which some had perished prematurely, others in the very birth, and of these survivors themselves no two were born alike, no two, as they grew up, have proved exact counterparts of each other.

On this assemblage of living units, of which no two were or are alike, influences for good or evil, of every degree of power, are brought to bear in infancy, in child-

hood, in youth, in manhood; and modes of life more or less virtuous or vicious, and occupations more or less healthy, counting by hundreds, offer themselves for choice; to say nothing of things over which they can exercise no control, such as the streets and houses in which they live, such as drainage and the supply of water. By such original and acquired differences, each population of human beings, like each living unit, comes to have a special character of its own. No other can be like it; nor can it itself remain for any length of time in the same state. Its numbers, and the ages of its living units, are subject to incessant change; and if a census were taken every year, these changes would show themselves annually in every column and line of figures.

Again, on this population is brought to bear every year, every month, every week, every day, some new combination of temperature, moisture, movement, and state of air, which we call weather, or, when we sum up their prevailing character during long periods of time, climate. And every year we have some atmospheric element which neither thermometer nor barometer, neither rain nor wind gauge, nor measure of moisture, nor test of ozone, can reveal to us, but only our records of sickness and death. One year it is such a state as favours small-pox, the next perhaps it will promote scarlet fever, or measles, or whooping-cough, or it will, so to speak, select from several forms of fever that one which shall fill the beds of our fever hospitals. This condition of air, of which disease itself is the only test and measure, was once called *pestilence*, but is now known as its *epidemic constitution*. And this, whenever it acts on the population with such energy that the disease which it favours affects large numbers of persons, that disease is called an *epidemic*. But this *epidemic constitution*, be it understood, is not its true and direct cause, but only its *predisposing cause*. The

exciting cause is some poison taken into the body, of which more presently.

I now return to my hypothetical case of a population of 4000 souls, which I assumed to exist at the beginning of the year; and I will try to realize what will have happened to it before the year is out. In the first place, some such number as 120 infants will be added to it in the course of the year, and by the end of it 100 out of the 4120 will have died.

Of this 100 deaths, about 10 will have happened in early infancy, and 6 in old age; and various external causes, some accidental, some intentional, will have swept away 4 more, making 20 in all. Of the 80 that remain, the wasting maladies of childhood, of youth, and of middle age (pulmonary consumption being the most fatal), will account for 18 deaths; various local maladies for about 25, and diseases of the lungs, including the bronchitis so fatal to old age, 16. There remain, as due to the diseases now known as "Zymotic," 21. These are close approximations to the true figures deduced from the mortuary records of London for the year 1850, a healthy year, following the cholera year 1849; and they may be taken as fairly representing the distribution of deaths, in accordance with the causes of them, in healthy years.

Now let us see what the cholera of 1849 did to change these figures. Why, it added largely to the figure for the zymotic class; in 1850, it was 9980; in 1849 (the year of the cholera) it was 28,313, and if we add the deaths in excess from diarrhœa and dysentery, we may safely say that even in these days an exotic epidemic may multiply by three the usual mortality of the class of diseases to which it belongs. This will give you some faint idea of what an imported disease may do to swell our tale of deaths, and the sickness of which these deaths are but a fraction.

Among the causes of the 100 deaths I have supposed to occur among a population of 4000, there are three leading groups that have a special interest for the student of hygiene: I mean the group of "tubercular diseases," of which pulmonary consumption is the chief; the group of diseases of the organs of respiration, in which bronchitis takes the lead; and the group to which the Registrar-General gives the name of zymotic. By this is meant an action like that of yeast on dough, by which a germ taken into the body multiplies itself indefinitely, and the body, in its turn, throws off and expels these germs, to become for other human beings the source of the self-same disease by which it has suffered. There is no better type of this group than small-pox; for you may have a small-pox patient covered from head to foot with tens of thousands of little blisters, you may take from one of these a small fraction of its contents on the point of a needle, and if you prick a healthy man with it, he will, in his turn, sicken of the disease, and throw out the same huge crop of blisters, and so on, from patient to patient, to the end of time.

Let us briefly discuss these three groups and their causes.

1. Tubercular diseases acknowledge as their cause a substance, hard as gristle, or soft as cheese, formed within or upon the textures of the body, inert and harmless for a time, but sooner or later stirring up inflammation, and so causing swellings or tumours, abscesses and open sores. If this intrusive matter occupies such outward parts as the glands of the neck, which it will do in children, it may fret and tease the body for a while, and leave behind it some ugly scar. This is the most common external form of scrofula, struma, or king's evil; and those who suffer in this way, or from this cause, are called scrofulous or strumous. The word *scrofula* has a fanciful and trivial derivation; but *struma*, which means "a heaping up,"

indicates the swelling that marks the early and sometimes the advanced stage of these tubercular diseases. This same scrofulous matter invades the bones and joints, and gives rise to those "white swellings" for which we have as yet no better cure than the knife of the surgeon. Most of these external diseases, when they prove fatal, are entered in our death-registers as "scrofula."

Another favourite seat of this intrusive matter is in those glands which are interposed between the vessels that carry the white nutritious fluid from the alimentary canal and those that circulate the red blood through the body. Here the scrofulous matter is both a mechanical impediment and a source of irritation, and the two together suffice to explain the painful contrast of swollen belly and shrunken limb which marks this, the *Tubes mesenterica* (the abdominal consumption) of the Registrar-General. Again, this same intrusive matter may thicken the membranes of the brain, and cause *hydrocephalus*, or water in the head. These wasting forms of scrofula are fatal to about 2500 children a year, here in London.

The group of tubercular diseases is completed by the one fatal malady of the adult—*pulmonary consumption*. Here the intrusive matter occupies the texture of the lungs, embarrasses the vital function of respiration, and wears life away by many exhausting discharges. It is the chronic plague of the prime of life; and destroys, in London alone, many thousands a year; often more than 1 in 7 of the deaths at all ages, and something like 1 in 3 of all our grown-up people. This is the disease of which I spoke in my first lecture as certainly amenable to the preventive influence of space, air, and ventilation in the places where men and women live, serve, or work; and also to the drainage and drying of the damp sodden soils of our towns.

2. The group of diseases of the lungs and organs of

respiration is scarcely less destructive to life than that of Tubercular Diseases; and it would head the list of fatal maladies if consumption were transferred to it. Bronchitis and asthma, its two leading constituents, are two of the fatal maladies of the advanced periods of life. They are, in a remarkable degree, dependent on the seasons and weather, and especially on cold; so that four times as many persons may die in the first and fourth quarters of the year as in the third—in the winter, as in the summer. And a disparity nearly as striking has been shown to exist between the colder weeks of one year and the corresponding warmer weeks of another. This fact was well shown by the younger Heberden, who compared the mortality from all causes in the first five weeks of 1795 with that of the same five weeks in 1796. The temperature in 1795 ranged between 23° and 29° ; in 1796 between 43° and 50° . In 1795 the total deaths were 2823; in 1796, 1471; or nearly twice as many in the cold as in the mild winter. How fatal this cold was to aged persons may be inferred from the fact that while the cold weeks of 1795 destroyed 617 children under 2 years old, and the warm weeks of 1796, 506, or 6 deaths in the first to 5 in the last, the deaths above 60 were 717 in the cold year, and only 153 in the milder one, or something approaching 5 to 1. Comparisons between cold and warmer weeks of the same year yield similar results.

3. The fatal diseases which the Registrar-General binds up together and labels as *Zymotic*, form a large mixed group, having for their common cause some poison, inserted into the body, or taken in with the air we breathe, or the water we drink; but also containing some diseases not due to this cause. This group then lacks the unity of cause which belongs to the other two; and looks rather to practical utility than to scientific exactness.

Of the 80 deaths remaining after subtracting such as

happen through violence, from old age, or in infancy, 55 may be arranged in three large groups, of which one acknowledges as its cause structural degeneracy, another is singularly amenable to atmospheric influences, a third is produced by poison, inserted or inhaled. But the causes of death may, of course, be classified in more ways than one. They may be grouped according to the ages at which the deaths occur, according to the seat of the disease, or according to its presumed cause. The tables of the Registrar-General exhibit a good practical compromise between the second and the third, and some of his tables display the ages at death. Let me add that while the first group might be enlarged by many fatal diseases known to be due to a gradual degeneracy, or slow spoiling of the minute textures, the second group might embrace cholera, diarrhœa, and dysentery as diseases that show themselves nearly as sensitive to the heats of summer, as bronchitis to the cold of winter.

I must now ask your attention to the class of fatal diseases with which we shall have chiefly to deal in this course—I mean *Epidemics*.

Now what do we mean by an Epidemic? Not a disease that kills a great number of people; for consumption does that, and yet is never called an epidemic. We always mean a disease that prevails extensively and yet exceptionally. If, for instance, in the winter, a few persons have common colds, we call their complaint a catarrh; but if our households, most of our neighbours, and almost everybody we meet or talk about have colds, we say they are the subjects of an epidemic catarrh, or influenza. If ague, after being long a stranger, runs through a village, as I have seen it do in Cambridgeshire, seizing one or more persons in almost every cottage, we call that too an epidemic, though it is common to speak of ague as an endemic, restricted to some district in which it attacks most

of the inhabitants sooner or later, some one year, some another. Again, if one person in a village or town, or town district, has the cholera, and soon after another and another, and if, day by day, attacks multiply till at length people become alarmed, they speak of this too as an epidemic. It is *Epidemic Cholera*. Bronchitis, in very cold, or diarrhœa in very hot, weather, might also become so prevalent as to be rightly called an epidemic.

All prevalent diseases, then, are not epidemics, nor all epidemics of the same class. The prevalence must be exceptional. Some epidemics, like the influenza and the attack of ague of which I spoke just now, are borne on the wings of the wind. They make a quick, sharp onslaught, and pass on. But others make their attack quite differently. First we hear of a single case; then, perhaps, the next week of another; then for several weeks together of 2, 3, or 4; then, for a few weeks more, the cases count by tens; then, after another series of weeks, by hundreds, and after another by thousands; then the maximum is reached. And now the disease declines by similar easy stages, the downward progress being sometimes slower, sometimes quicker, than the upward. This may be going on for the better part of a year, as was the case with the plague of the seventeenth century, and the cholera of our own times.

An *Epidemic*, then, being a disease exceptionally prevalent, whether mild or severe, our own experience in times past teaches us to recognise at least three distinct varieties of it—the *exotic*, the *indigenous*, and the *naturalized*. To the exotic variety belong such diseases as plague and cholera; to the indigenous, such as ague and scurvy; to the naturalized, such as small-pox and scarlet fever. To these we may add, as sometimes taking on an epidemic character, bronchitis in severe winters, and English cholera in hot summers. It is equally obvious that there are two

varieties of epidemic very distinct the one from the other—the *non-contagious* that do not, and the *contagious*, or *infectious*, that do spread from person to person. Ague, scurvy, and influenza are of the first order; plague, small-pox, and scarlet fever, of the second.

Now, I need not tell you that the medical world has been divided into two hostile camps on the question of the true nature of certain epidemics; that there have been *contagionists* and *anti-contagionists*; the one set alleging that plague, for example, is not, the other that it is, a contagious malady. Or the battle has raged over typhus fever with equal confidence of assertion. And this conflict of opinion will not surprise us if we call to mind the curious fact that Italian physicians look on consumption as a contagious disease; or have regard to the prejudices and preconceived opinions with which Englishmen especially must approach this question. To a great mercantile nation like ours, the doctrine of contagion leads straight on to the troublesome restrictions of quarantine, and this consideration has certainly blunted the perceptive faculties of some. All, again, who are deeply interested in sanitary reform, are apt to imbibe an unconscious predilection for the doctrine that all diseases which prevail epidemically, are the offspring of filth and overcrowding in the worst houses and districts of our towns; and so earnest and excited do some advocates of this doctrine become, that they deny the very existence of contagion. This extreme doctrine is rejected by all the best authorities, and the theory of contagion is now more widely and firmly held than ever. Now I think I can throw some new light on this question if I first lay down certain general laws relating to epidemics, and then have recourse to that numerical method which I commended in my first lecture.

Taking an epidemic to mean a disease prevailing ex-

tensively and exceptionally, it is clear that the question of contagion can have no place in respect of some diseases so defined. There never has been a question about bronchitis, however exceptionally prevalent it may be in winter, for cold accounts for that; nor of diarrhoea in the summer months, for heat will explain that. Nor has this question arisen in reference to scurvy, for short supplies of food, or errors of diet, fully account for it. The epidemics concerning which this question of contagion has been raised, are such as prevail over large tracts of country, invading first one district, or town, or village, then another, passing from one nation to another, travelling over vast continents, and crossing wide seas; in extreme cases, visiting in succession every quarter of the globe. Cholera and influenza, and the black death, of which I am soon to speak, answer fully to this description.

Let us follow one of these epidemics, such as cholera, step by step. It has its birthplace in the East, in the sunderbunds of Bengal; it journeys from country to country, and place to place, by preference along the great lines of intercourse; but neither rivers nor seas stop it. Sometimes it is demonstrably contagious; sometimes it seems to be borne along in currents of air, so that it will strike down the inhabitants of one side of a street, or one section of a camp, and spare the other. In every spot it visits, it affects the inhabitants much in the same way; it inflicts its sudden deaths, it stirs up its acute illnesses, some to end in death, some in recovery. It is a poison which can enter the body, either in the air we breathe, or the water we drink; and when it has effected an entrance, the body tries to rid itself of it, and the channel it chooses for the purpose, is the alimentary canal; its efforts to free itself being made during what seems to be the prolonged cold fit of a fever: and it is in this stage that most

cholera-patients die. This disease, too, like others of its class, is most fatal when it first breaks out, least fatal when it is passing away. How it selects its victims we do not know, and cannot be expected to learn. Some whom it kills quickly seem in the rudest health, others who are longer in dying are obviously less vigorous. Whether a man is to succumb or recover, probably depends in part on the strength of the dose, but in part on his having, or not having, some unsound organ which will not bear the congestion of the cold, or the quickened circulation of the hot, stage. The intemperate man is always taken at a disadvantage, and the chances of escape lessen with age. Another fact must be specially noted, as common to all epidemics—the poison, when it does not kill by sudden shock, remains for a variable period, in some shorter, in others longer, inert. The seed is sown, but takes time to germinate. The interval of real or apparent inaction is known as the period of *incubation*. It is not easy to fix the limits in these maladies. In cholera it is thought to extend from three days to a week; in typhus fever from a few minutes or hours, to a few weeks or months. The fact that there is this period of inaction, or incubation, helps to explain some apparent anomalies. The cholera, considered as a type of the class to which it belongs, has one or two other characters worth noting. It has been more than once preceded by the milder epidemic, influenza; it has given something of its own character to other diseases prevailing before, during, and after its own visitations; it has seemed to require time to develop itself in the several places which it attacks, for several weeks will sometimes elapse before the weekly deaths exceed one or two; and it is certainly, as a general rule, fostered and promoted by overcrowding and uncleanness.

This rude sketch of cholera will apply, with little

modification, to all diseases of the epidemic class, which have been imported from abroad, and have not become naturalized among us.

Let us now look to our numerical returns, and see what they teach us respecting epidemic maladies; and what light they throw on the question of contagion in the cases where that question finds place. I will take our annual reports first, and then our weekly ones. For the annual facts I refer to a paper of mine published in the "Statistical Journal," in 1855, in which I reduced the figures for London, during the fifteen years from 1840 to 1854, to a common scale of the deaths per million in a year of 365 days. I will take the figures relating to the second cholera epidemic first, premising that there is a disease known as English cholera, but set down by the Registrar-General simply as cholera, which, in the fifteen years in question, never caused less than 15 deaths, and in more than one non-epidemic year, upwards of 60. Well! in 1847, the deaths were 52; in 1848, 292 (marking the beginning of an epidemic); in 1849, they rose to 6209; and in the following year fell to 55. Again, the influenza, which, in 1845, occasioned only 35 deaths, and in 1846, 55, is credited with 562 in 1847, and 295 in 1848; and it fell to 56 again in the great cholera year, 1849. Now these figures are in harmony with the notion of an imported pestilence, and with all that I have been saying about cholera as a good example of a pestilence imported, but not naturalized. In the first year, its victims are comparatively few; in the second, very numerous; and the influenza, its forerunner, closely resembles it.

Let us now turn to *Scarlatina*, the most fatal of our naturalized epidemics. In no year of the fifteen did it cause less than 354 deaths; but in 1848, it occasioned 2132. To this number it rose from 643 in 1847, and from it, it fell to 943 in 1849. In 1850 the deaths were

507. The figures harmonize completely with the notion of a disease always active, sometimes raging with epidemic violence.

Let us now see how the figures stand for some one epidemic of the Plague, say for 1665. In that year the deaths were upwards of 68,000; the year previous only 6; the year following, 1998; and the year after that, 35. So that, just as now we have an English cholera and an imported Asiatic epidemic cholera, in more remote times we had an English disease entered on the Bills of Mortality as plague, and an imported Oriental plague; and in both cases the figures are consistent with the idea of an imported pestilence, not naturalized among us.

Next let us take Bronchitis. In no year of the fifteen did it cause fewer than 271 deaths; but in 1853 it destroyed 2083. But, inasmuch as it occasioned 1552 deaths in 1852, and 1814 in 1854, it is obvious that we have to do with a disease which may be rendered more fatal one year than another by such a cause as a cold season, but which lacks the strong numerical contrasts of an imported epidemic; as, indeed, do our naturalized pestilences.

And lastly, let us take the eminently fatal disease, Pulmonary Consumption. The lowest figure for the million inhabitants of London in any year is 2645, and the highest 3941; and the fluctuation from year to year is very slight. I will give you the figures for three consecutive years:—1849, 2777; 1850, 2645; 1851, 2970. If, then, any one were to assert that this disease is contagious, which is tantamount to saying that it may be epidemic, the figures I have quoted would in themselves furnish an answer in the negative. They are suggestive of a domestic disease influenced, as is bronchitis, by the seasons and weather.

Let us now look at the *weekly* returns for the six diseases of which I have been speaking—cholera, plague,

influenza, scarlatina, bronchitis, and pulmonary consumption. As I have the figures at hand, I will take the cholera epidemic of 1854. Now, for more than half a year (till the middle of July) no weekly entry of deaths from cholera exceeded 2, and more than once, for many successive weeks, no death by cholera was reported. But for the week ending July 15, there was an entry of 5 deaths; and now the epidemic seems to have set in, for the next week the deaths were 26; the next, 133; the next to that, 399; then 644, and so the disease went on increasing week by week, till in the eighth week it reached its maximum mortality of 2050. It took thirteen weeks to fall again to 5, and the next week to that the deaths were 2. It may be said to have prevailed twenty-one weeks, during eight of which it rose progressively, and during thirteen fell. There was no fluctuation. I now take a year of the plague, 1625. From the first week in January there were entries of deaths varying from 1 to 5, with more than one blank week; then on March 14, we have the first of a series of unbroken entries, 4, 8, 11, 10, 24, 25, 26, 30, 45, and so on, till, after twenty-two weeks, the maximum entry of 4463 is attained, and then, in seventeen weeks more, the deaths have fallen to zero. The epidemic has passed away.

Now, between these epidemics of cholera and plague there is an unmistakable resemblance. They are evidently diseases of the same class. The figures on the death registers rise to an unwonted height in certain years only. They harmonize with the theory of an imported disease. But there is this difference. The cholera of 1854 attained its maximum in eight weeks, and subsided in thirteen; while the plague took twenty-two weeks and seventeen weeks to accomplish the same feats. The figures for the cholera are suggestive of a disease carried chiefly in currents of air; those for the plague of one

spreading more slowly by direct contact and exposure of the healthy to the sick.

The influenza of 1847-8 had obviously more affinity with cholera than with plague. Like the cholera, it quickly attained its maximum, but showed a more gradual decline. From October 30, 1847, when one death was reported, it took seven weeks to reach its climax; but twenty-one weeks elapsed before the mortality fell to zero.

In reference to Scarlatina, I take the figures of the year 1854, in which it may be said to have been epidemic, as the cholera was. There was no week in the year without deaths from this cause, 22 being the lowest figure in the early part, and 118 the highest towards the end, and there were constant fluctuations; so that there seemed to be rather a series of short epidemics than one long one. Thus the last eight weeks of the year showed the figures 101, 106, 118, 90, 100, 95, 79, 82. The weekly returns for the year exhibit a disease little influenced by weather, naturalized, always active, sometimes epidemic.

Bronchitis, again, is a disease of a different order. I will take the weekly figures for the fatal year 1853. Now the first leading fact that shows itself in the weekly returns is that the high figures belong to the beginning and end of the year; the low ones to the intermediate period—the high to the winter, the low to the summer. The next fact is that, whether the figures are high or low, they are subject to a constant fluctuation, obviously connected with the temperature, though not exactly dependent on it. Thus, for six weeks in succession, the thermometer falls from 45° to 30° , and the death-rate rises steadily from 67 to 184; but now, for three other weeks, the deaths rise steadily to their maximum for the year, though the temperature rises too. It is clear, then, that we have more than one cause in operation besides the temperature; but

we have not the progressive rise to a maximum and progressive fall of the cholera or the plague.

Lastly, the weekly entries of deaths from consumption in this same year, 1853, fluctuate between 104 and 179, showing remarkable steadiness, distinctly influenced by temperature, but in a less degree than bronchitis. The disease is evidently not imported, not contagious, nor epidemic.

I have placed these figures before you at the risk of seeming tedious, because I wish to show what assistance they may be made to afford in the solution of difficult questions of causation.

And now I pass on without further delay to speak of the epidemics which occurred in England up to the middle of the fourteenth century, when the black death appeared, remarking, however, by way of preface, that no age or country of the world seems to have been free from severe epidemic visitations, or from those calamities which so often precede, accompany, or follow them. The sacred history of the Jews, for instance, contains references to five famines and ten plagues; and the history of Rome before the Christian era, to thirty-two plagues, of which four were associated with famine, two with earthquakes, and one with both. The early history of Greece, too, bears evidence of the frequent visitations of drought, famine, flood, and earthquake, with epidemics of great severity. The plague of Athens, in the year 428 B.C., was one of these. Again, in the early centuries of the Christian era, we have notices of many plagues among all the nations of which we possess any historic records; and the whole Roman empire was devastated by mortal epidemics in the second and third centuries, and by the Egyptian plague twice about the middle of the sixth century.

Of the epidemics which visited our own country in the earlier periods of our history, I observe, by way of preface, that the accounts we have of them are few in number, and

that, when they become more numerous, they are mixed up not merely with incredible, but with impossible tales of storms, earthquakes, inundations, meteors, showers and streams of blood, and armies fighting in the clouds. The first famines that befell our ancestors are set down for the years 272, 306, and 310; and the first plague for 430. One famine is assigned to the sixth century (514); one plague (558). In the seventh century, we have notices of 1 famine, 2 epidemics, and 1 coincidence of drought, famine, and pestilence. In the eighth century mention is made of 2 famines, 1 drought, and 1 epidemic very fatal at Chichester; in the ninth, of a famine, a pestilence, and 3 winters of extreme severity; and in the tenth, of 3 famines, 4 severe winters, and 2 plagues affecting man and beast, of which one was a bloody flux. From this time forth our notices become much more numerous and much fuller. The first year of the eleventh century is marked by a bloody flux and hot burning ague; and the year 1087 by an epidemic erysipelas; and we have notices of 11 plagues associated with famines, epizootics, or both. In the twelfth century 15 epidemics, among which 2 of erysipelas, 1 of bloody flux, and 1 of burning ague, with many famines, and several epizootics are mentioned; and in the thirteenth, 12 epidemics, 8 epizootics, and 19 famines, the human epidemics being several times associated with cattle-plagues, with famines, or with both. Ague is specified as epidemic in 1236. The notices of plagues, epizootics, and famines in the first half of the fourteenth century are not so numerous as in the centuries preceding. We have notices of 4 epidemics (1 dysenteric), as many epizootics, and more famines.

And now we come to the fatal year 1348, which forms the boundary line between the first and second of the three epochs into which I have distributed the health-history of England up to the end of the eighteenth

century. It is the year of the *Black Death*, or *Great Mortality*.

The Black Death, though usually treated as an aggravated outbreak of the Oriental Plague, which is, by very general consent, traced to Egypt as its birthplace, has had assigned to it an origin more remote. Hecker fancies he finds the source of it in China in 1333, fifteen years before it showed itself in Europe; and Anglada, in his "*Etude sur les Maladies éteintes*," traces it by three distinct routes from Black Cathay; the northern route, by Bokhara and Tartary, the Black Sea and Constantinople, having brought it by the Bosphorus into the Mediterranean, and so into Europe. In the interval between 1333 and 1347, China was visited with drought, famines, torrents of rain, floods, earthquakes, swarms of locusts, and pestilence; and at length, in 1348, Europe began to suffer by the same visitations. The island of Cyprus was converted into a desert by a frightful earthquake, hurricane, and inundation, following the outbreak of the plague; and there was observed what was noticed in many countries and cities afterwards—a peculiarly offensive state of the air, sometimes spoken of as a stinking mist, possibly due to the dead locusts which had "never perhaps darkened the sun in thicker swarms," and by countless unburied bodies of men and beasts. On the 25th of January, of this same year 1348, an unexampled earthquake lasting several days, visited Greece, Italy, and the neighbouring countries, shaking down, or swallowing up, whole villages, and inflicting severe injury on every large city. Others occurred from time to time in all parts of the continent of Europe, and in England, up to the year 1360.

The Black Death reached England in August, 1348, appearing first in the county of Dorset, thence spreading through Devon and Somerset, to Bristol, Gloucester, Oxford, and London; in fact, through the whole country.

It took three months to reach London; few places are believed to have escaped, and only a tenth part of the inhabitants were thought to have remained alive. There is no room to doubt that the symptoms of this Black Death were those I shall, by-and-by, have to describe as belonging to the Oriental plague. All the accounts that have come down to us, from the imperial author, Kantakusenos, who saw the disease in Constantinople; from Boccacio, who witnessed it at Florence; from the scholar Raymond Chalin de Vinario, and from the "brave" Guy de Chauliac, who practised at Avignon—all the accounts conspire to justify Hecker's statement, that "It was an Oriental plague, marked by inflammatory boils, and tumours of the glands, such as break out in no other febrile disease;" to which I must add that it often proved fatal on the second and third day, in the midst of profuse discharges of offensive smelling blood from the lungs, such discharges as we now know to attend and characterize gangrene of those organs. Guy de Chauliac, than whom we can have no better authority, divides the whole epidemic of seven months into two stages of two and five months, respectively, of which the first was characterized by the bloody discharges from the lungs, the second by the characteristic plague-tumours. I shall condense de Chauliac's account, as quoted by Anglada, with the preface he so well deserved.

"I speak of Guy de Chauliac, one of the glories of our school" (Montpellier), "one of the great medical characters of his age. Attached to Pope Clement VI., he had himself an attack of the prevailing malady, which, by a happy exception, spared his life. Slave to his noble duties, he remained immovable at his post, in the midst of the universal panic, while his colleagues meanly sought safety in flight." This is the brave doctor's account of the disease :—

The mortality set in in the month of January, 1348, and lasted seven months. It was of two kinds: the first lasted two months, with continued fever and spitting of blood, and people died of it in three days; the second lasted five months, also with continued fever, and aposthumes and carbuncles on the external parts, and chiefly in the armpits and groins, and people died of it in five days. The disease (especially that form of it attended by spitting of blood) was so contagious that not only by being with the sick, but by looking at them, one took it of another; so that people died without servants, and were buried without priests. The father did not visit his son, nor the son his father. Charity was dead, and hope extinguished. The disease was so fatal that it scarcely left a fourth part of the people alive. Medical treatment was useless, for all the sick died, except a few at the end, who escaped with ripe buboes. For preservation there was nothing better than flight. Aloetic pills; letting of blood; purification of the air by fire; comforting the heart by theriaca, apples, and things of good odour; consoling the humours by bole armeniac, and resisting putrefaction by acid things, were recommended as preservatives. For the cure, bleeding and evacuations, electuaries and cordial syrups; figs and cooked onions mixed with plantain and butter, to ripen the swellings, followed by incisions and the usual treatment of open sores. The carbuncles to be cupped, scarified, and cauterized. "And I," says the good doctor, "to avoid shame, dared not absent myself, but, in constant dread, preserved myself as well as I could by means of the remedies above described; but, nevertheless, towards the end of the mortality, I fell into a continued fever, with a swelling in the groin, and was ill more than six weeks, in such great danger that all my friends thought that I should die. But the swelling

ripening under the treatment I have described, I escaped by the mercy of God."

The mortality due to the disease cannot be exactly ascertained for want of censuses and registers of death; but doubtless it was on a grand scale. We infer this partly from numerical statements and partly from more general accounts. Let us take them by cities, communities, and nations.

Aleppo lost 500 a day, Gaza 22,000 in all, and Cairo 15,000. Genoa lost 40,000, Parma the same number, Naples 60,000, Siena 70,000, Rome an incalculable number. Venice, out of a population of 200,000, lost 70,000, saw 90 patrician families extinguished, and its grand council of 1250 reduced to 380. In Florence, 100,000 perished between the months of March and July. In Spain, Valencia lost 300 a day, and many districts of Barcelona were depopulated. In Germany, at Vienna, the deaths were 1800 in one day, and 40,000 in all. At Erfurt 12,000 were interred in one cemetery. In France, at Avignon, 1800 died in the first three days, 150,000 in the city and its environs, and at the very first, 66 monks in a Carmelite monastery; there, too, died Petrarch's Laura. Montpellier was very nearly depopulated, 10 out of 12 consuls died, not a monk survived, and few medical men. Marseilles lost in one month 56,000, and the bishop and his chapter all died. Narbonne suffered a loss of 30,000, from which it never recovered. Paris lost 50,000, and Saint Denis 16,000; and for many days together the Hôtel Dieu sent 500 corpses to the cemetery of the Innocents. We lost here in London 100,000.

Passing from cities to nations, we find the mortality in China, whence the plague is supposed to have sprung, set down at thirteen millions; in Germany it was 1,244,434; Europe is supposed to have lost an aggregate of forty

millions, and Asia and Africa (exclusive of China) twenty-four millions.

If we take classes of persons, we find the order of Minorites in Italy credited with 30,000 deaths, and the Franciscan Friars in Germany with 124,434.

We have, Hecker says, "more exact accounts of England," and he specifies Yarmouth, Norwich, Bristol, Oxford, Leicester, York, and London as cities that suffered "incredible losses." In Yarmouth 7052 died, in Norwich, 51,100, in London 100,000, a number in some sense confirmed by the statement that, "in one burial ground alone, there were interred upwards of 50,000 corpses, arranged in layers, in large pits."

That a truly frightful mortality did prevail over the whole of Europe may be inferred from such statements as these:—"Cyprus lost almost all its inhabitants; and ships without crews were often seen in the Mediterranean, as afterwards in the North Sea, driving about, and spreading the plague wherever they went ashore." Speaking of France, Hecker says that, in many places, "not more than two out of twenty of the inhabitants were left alive," and of Paris that "more than 500 a day died in the Hôtel Dieu, under the faithful care of the sisters of charity," to whom he pays a deserved tribute of praise. At Avignon, we are told, that "the Pope found it necessary to consecrate the Rhone, that bodies might be thrown into the river without delay, as the church-yards would no longer hold them." Such was the fearful loss of life which entitled this pestilence to the name of the *Great Mortality*.

Here in England the pestilence had consequences worth noting. It found us with "a superabundance of all the necessaries of life," but it was followed by a "fatal murrain among the cattle," and this, with the lack of labourers to gather what was a plentiful harvest from the fields, led to

a great rise in the price of food. Hecker's history, as it relates to England, ends thus:—"For a whole year, until it terminated in August, 1349, the Black Death prevailed in this beautiful island, and everywhere poisoned the springs of comfort and prosperity."

But here, as throughout Europe, the pestilence had also antecedents worth noting. The times were very barbarous. Kings were in constant conflict with powerful subjects, or engaged in external wars; cities were fortresses; the roads were beset with marauders; the husbandman was a serf; human life was of little account; witches and heretics were burned alive, and the Jews subject to cruel tortures; "wild passions, severity and cruelty, everywhere predominated;" and (what is more to our present purpose) the cities were "with few exceptions, narrowly built, kept in a filthy state, and surrounded with stagnant ditches." These conditions, even in those early times, were recognised as favourable to the spread of pestilence, as were personal uncleanness and intemperate habits.

The cities in those days were so built as to be eminently favourable to that overcrowding now so universally recognised as a most efficient cause of disease. Armies also, which are crowds in the worst form, were in constant motion. We had a deadly feud with France, and Calais surrendered to Edward III. in 1347; and we have an excellent illustration of the mischievous agency of armies in spreading contagious maladies in the fate that befel the Scots. They are stated to have been free from the pestilence till they made an irruption into our territory. This issued in the destruction of their army by the sword and the plague together, "and the extension of the pestilence through those who escaped, over the whole country." On the continent of Europe, the crowds that followed the processions of the Flagellants certainly promoted the spread of the Plague.

Of the treatment of the Black Death I have nothing interesting or instructive to tell you. But something may be said with advantage of *preventive measures*. Hecker tells us that the first public measures of defence against the Plague were adopted within a few years after the passing away of the Black Death; and he cites as the first sanitary code certain regulations of Viscount Bernabo, dated 17th January, 1374. "Every plague-patient was to be taken out of the city into the fields, there to die or to recover. Those who attended upon the plague-patient were to remain apart for ten days." "The priests were to examine the diseased, and point out to special commissioners the persons infected, under punishment of the confiscation of their goods, and of being burned alive. Whoever imported the plague, the State condemned his goods to confiscation. Finally, none except those who were appointed for that purpose, were to attend plague-patients, under penalty of death and confiscation."

Viscount John, the successor of Bernabo, in the year 1399, when the plague broke out in Italy for the sixteenth time (to say nothing of frequent visitations of measles and small-pox), enforced measures which would do no discredit to a sound sanitary reformer of our own time. He "ordered that no stranger should be admitted from infected places, and that the city gates should be strictly guarded. Infected houses were to be ventilated for at least eight or ten days, and purified from noxious vapours by fires, and by fumigations with balsamic and aromatic substances. Straw, rags, and the like were to be burned; and the bedsteads which had been used, set out for four days in the rain or the sunshine, so that, by means of the one or other, the morbid vapour might be destroyed. No one was to venture to make use of clothes or beds out of infected dwellings, unless they had been washed and dried either at the fire or in the sun. People were, likewise, to avoid,

as long as possible, occupying houses which had been frequented by plague-patients."

These regulations go far to show what was then thought by learned physicians of the nature of the disease; and I cannot do better than quote Hecker's summary of the prevailing notions and views:—That the *pestilence*, or *epidemic constitution*, is the parent of various kinds of disease; that the plague sometimes, but not always, originates from it; that in modern language *the pestilence* bears the same relation to contagion that a predisposing does to an occasional cause, and that the conviction of the contagious power of the disease was universal.

This persuasion of the contagious character of the Plague bore fruit in later times in Italy. In 1485, a special council of health was appointed in Milan, and lazarettos were established on islands at some distance from the city. Somewhat later (in 1504) this council had conferred upon it the power of life and death; and later still (in 1527) bills of health were introduced. The lazarettos on the islands were for the detention of strangers coming from suspected places. But when the plague appeared in the city itself, the sick with their families were sent to the "old lazaretto," where they were furnished with provisions and medicines; and when cured were despatched to another island lazaretto, where they, and all who had intercourse with them, were detained 40 days; hence the word *quarantine*.

I have some observations to make on the moral, religious, and political consequences of this great mortality; but these I reserve for the beginning of my next lecture, in connexion with the subject of mental epidemics of which the most remarkable outbreak signalized the epoch of the Black Death.



LECTURE III.

THE SWEATING SICKNESS.

IN my last lecture I described the Black Death of the fourteenth century in its *physical* aspects, with its antecedents and accompaniments of terrestrial and atmospheric disturbances, the barbarous and unsettled life of the people, and the filthy and unwholesome state of the great centres of population. I have now to treat of what I may call its *mental* aspects ; and this I shall do under the distinct heads of moral, religious, and political. This done, I shall notice briefly those strange outbreaks of nervous disorder which in a remarkable degree characterized the epoch of the Black Death, though they were by no means peculiar to it. I shall then say a few words about the Black Death as it affected us in England, and pass on to the *sweating sickness*. Of the *mental* effects of the Black Death, it has been said that it gave to all nations a shock “ without parallel, and beyond description.”

Its effects on *morals*, by which I mean the actions prompted by the natural emotions and passions of mankind, other than those that flow from religion, must have been of a mixed character. The kind and generous, always a small minority, were doubtless moved to acts of heroic self-sacrifice ; but the indifferent and selfish (a far more numerous class) were guilty of acts of base desertion ; the harsh and unfeeling grew cruel ; the criminal class found rare opportunities for the indulgence of their predatory habits ; and those addicted to the worst forms of dissipa-

tion sinned under the pretence that the natural result of their vicious practices would prove a safeguard against the more fatal infection of the plague. We read therefore, without surprise, that "parents abandoned their infected children, and all the ties of kindred were dissolved;" that "morals were deteriorated everywhere;" that at Florence, as elsewhere, "the influence and authority of every law, human and divine, vanished;" that, in a word, selfishness assumed such gross forms that it became a common practice "to barricade the doors and windows of houses infected with the plague, and to suffer the inhabitants to perish without mercy."

The *religious* effect of the black death in those superstitious ages was to intensify every prejudice and heighten every dislike. The Jews were accused of poisoning the wells and streams, and were burnt, banished, or forcibly baptized by thousands and tens of thousands; or driven to wholesale acts of suicide: while the processions of the Flagellants exhibited a ghastly spectacle of nervous disorder, debasing superstition, and vicious self-indulgence. These scenes of cruelty and horror were not, however, quite unrelieved. History records acts of devotion on the part of some of the monastic orders; and we read of the sisters of mercy in the Hôtel Dieu dying at their posts, their places at once filled up by willing and devoted women, "strangers to the unchristian fear of death:" so that even to the dark religious aspects of the pestilence there was a silver side.

The *political* consequences of the black death are believed to have been very important. Hecker traces to it an immense accession of wealth to the clergy, and Lecky a sudden taste for luxurious living among all classes. It certainly raised the wages of labour everywhere, and added weight and importance to the working class. As a class it suffered frightfully; as a class it obtained this compensa-

tion. In my first lecture I quoted other passages in proof of the profound social and political consequences which the pestilence produced.

When speaking of the religious effects of the black death I might have noticed with propriety the proceedings of the Brotherhood of the Flagellants, Brethren of the Cross, or Cross Bearers, which took its rise in 1349, when 200 of them made their appearance at Strasburg, were joyfully received and hospitably lodged; soon grew to a multitude; spread themselves over Germany, Hungary, Poland, Bohemia, Silesia, and Flanders; and moved from place to place, inflicting on themselves their strange penances. How the movement, at first superstitious, degenerated into a mixed mob of ignorant and mischievous fanatics opposed to the Church and hostile to the State; how the Pope put a stop to the pilgrimages by threats of excommunication; how kings resisted them; and how, at last, they became objects of bitter persecution, you will find set forth in the pages of Hecker, which also contain learned notices of similar processions of Flagellants in the eleventh, thirteenth, and earlier part of the fourteenth centuries. I may also refer you to Hecker's work for a very complete account of the Dancing Mania, which, beginning in the thirteenth century, showed itself at intervals in the fourteenth and fifteenth centuries. Dr. Babington's translation is enriched by interesting notices of similar convulsive diseases occurring in later times in Scotland.

The processions of the Flagellants form part of the sanitary history of the Continent, and especially of Germany, where they took their rise. I shall not, therefore, consider them as belonging to my subject, or discuss, as I am tempted to do, the interesting question whether these manifestations of a disordered mind and nervous system may be directly attributed to the same atmospheric con-

ditions that so fatally affected the body, but shall resume the subject of the Black Death as it relates to England.

The accounts of the disease in England are in harmony with those which have come to us from Italy and other parts of the Continent. We read of the same atmospheric disturbances, with the addition that its advent was preceded by great floods. "It rained from Christmas to Midsummer, without one fair day;" and when it left us "there followed a great dearth of cattle; after that a dearth and scarcity of corn." We read of 5000 cattle dying in one pasture, of beasts and sheep going wild through fields and "corns," and dying in holes, furrows, and ditches, in innumerable multitudes over the whole kingdom, for want of keepers; of the scarcity and insolence of servants, and consequently, the next harvest, of corn rotting in the fields for want of hands. Short, from whose compilation I take these particulars, fixes the date of the arrival of the pestilence on the coast of Dorsetshire as September 28, 1347. He says that it reached Scotland and Ireland in '50 or '51, and that it did not finish its "perambulation over the world" before '60 or '62. He tells us that "if it was so favourable as to leave a third part of men alive in some few places, in others it took 15 out of 16;" and that "in more it utterly extirpated the human race." He gives the deaths for Yarmouth at 7052; for Norwich in six months, at 57,000; for London during three months, at 2000 a week. "It is said at a medium, to have killed 9 out of every 10." In England, as elsewhere, the Jews were accused of poisoning the springs; and this accusation Short traces to the fact that the water was pestilential even to the fishes. Of this wide-spread belief in the poisoning of wells and springs of water, not in the time of the Black Death only, but during all great epidemics, I may observe once for all, that recent discoveries have rendered it highly probable

that the people were not always mistaken as to the fact of the poisoning, but only as to its nature and the persons who caused it. In those remote times, the state of the places in which men lived, and their habits of life, rendered the pollution of drinking waters by human excreta inevitable, and so secured the rapid spread of any contagious disease that happened to prevail.

One curious statement, which is made by the same author, without any direct reference to his authority for it, is to the effect that "Tanners, curriers, such as cleansed bog-houses, servants in hospitals, and others employed in other nasty stinking businesses, all escaped infection."

Of course, in those remote times, there must have been the strangest misconceptions, the grossest exaggerations, the roughest guesses at truth; but in the midst of much that is false in degree if not in essence, there stands out in bold relief the great central fact, that in the middle of the fourteenth century, a pestilence not surpassed by any recorded in history, for the ground it covered, or the destruction of life it occasioned, came to us from the East; that it had the characters of the bubo plague with spitting of blood superadded; that it attacked a large proportion of the population, and destroyed an equally large proportion of those whom it seized; that it disorganized society, inaugurated a reign of terror, gave free scope to every vile passion and unworthy prejudice, and if it in any degree promoted religion and stirred up repentance and amendment of life, it was at the cost of a speedy and lamentable reaction. The dwellings and personal habits of the English people in town and country were such as to encourage to the utmost the pestilences we bred or imported. Judging from the descriptions of foreigners we were characterized by bad housing and gross feeding. The state of things is not likely to have been better in any respect, it was probably worse in all, than when in

the sixteenth century the Dutch scholar Erasmus wrote the letter which I am to quote when I treat of the Sweating Sickness. Nor, on the other hand, was it likely to have been very different from the account given us by the old chroniclers, Holinshed, Stow, Baker, and Martin. After careful perusal of the extracts which I have made from their works, and reference to Pearson, Rogers, and others who have written about the Middle Ages and the twelfth and subsequent centuries in particular, I imagine the people to have lived somewhat after this fashion :— Their houses, and most of their buildings of every kind, were of timber, the houses “slightly set up with a few posts and many radels,” “cast all over with thick clay to keep out the wind,” with sundry rooms above and beneath “covered with straw, sedge, or reed, and rarely with tiles or slate,” and with floors of mud. In the country parts, houses, stables, and offices were under one roof. The fires were lighted against a *rere-dos*, and the smoke escaped as best it could, without the help of chimneys, for these, though introduced in the twelfth century, were but slowly acclimatized. The people lay on straw pallets or rough mats, with a log for a pillow ; and the man who contrived to buy a flock bed, and a sack of chaff for his head to rest upon “thought himself as well lodged as the lord of the town.” Servants were lucky if they had a sheet above them : they had none beneath. The sheep’s skin was in common use as clothing. The poor, wanting water, built at the river’s edge. The Spaniards, in Queen Mary’s day, wondered “when they saw what large diet was used in many of these so homely cottages,” and one of no small reputation among them is credited with the not very complimentary remark that, “The English have their houses made of sticks and dirt, but they fare commonly so well as the king.” The poor are believed to have lived well, in good years, on barley or oaten bread,

beer and pork; but to have been subject to famines frequent and terrible. There was an abundant supply of fish, both from sea and river. Pearson tells us that "the vineyards the Romans had planted survived Saxon and Dane;" that "Gloucestershire was famous for them, and Smithfield was once ruddy with grapes. But gardens were of slow growth, and comparatively few fruits and vegetables had been naturalized." It is likely, therefore, that many of the people living of necessity, or through ignorance, on a diet from which the vegetable element was excluded, suffered the more severely in times of pestilence. And thus it happened, that "poisoned by marsh exhalations, wasted by ague and skin diseases, huddled together in cabins, smoke dried, gross eaters and uncleanly livers," the peasants suffered terribly during every epidemic visitation. Within our walled and fortified towns, the state of things was not likely to be much better. Thus I glean from a passage in Stow's *Chronicles* that even capital cities were unpaved till towards the end of the twelfth century. "This year, 1246," he says, "the city of Lubeck was destroyed and consumed by fire," "and from that time it was ordered that they should not cover their houses any more with thatch or straw, but with tiles or such like:" the very same common danger caused London to tile all its houses shortly after, especially such as stood close together in a high street. "Neither were there then but few streets in London paved, nor in 200 years after this, except Thames Street, and from Ludgate to Charing Cross, neither was the great City of Paris paved until the year 1186." London, therefore, in the middle of the fourteenth century was almost wholly unpaved. In the middle of the twelfth century, if we may credit the monk, William Fitzstephen, who died in 1191, London consisted of two long narrow tracts of land, separated by the Thames, which then abounded in fish. It was surrounded

with high walls, strengthened with towers and double gates, with a "tower palatine" on the east, and two castles on the west, and the king's palace in the same quarter on the river, with its walls and bulwarks, separated by two miles from the city. The suburbs were studded with the houses of the citizens, with their gardens and orchards. On the north, there were pastures, and meadows, and plentiful corn fields; and near at hand was a large forest, with wild beasts, bucks and does, boars and bulls. Here, too, were flowing waters, and busy water-wheels and fountains, sweet, wholesome, and clear, welling forth among the glistening pebbles. There was Holywell, and Clerkenwell, and St. Clement's well, the resorts of scholars and youths on summer evenings. Without one of the gates was a certain Smoothfield (now Smithfield), where horses were sold. In the city there were common sewers, and conveyances for water in the streets. For amusements there were miracle-plays, land-fights and water-fights, leaping, shooting, wrestling, ball and stone-throwing, casting the javeline, cock-fighting and baiting of boars, bulls, and bears. The city mustered the improbable number of 80,000 armed men (20,000 horse and 60,000 foot). Its citizens were distinguished "for their civil demeanour, their good apparel, their table, and their discourse," and its matrons might compare with the Sabine women. There was abundance of provisions and good cooking, and "the only plagues of London are, immoderate drinking of idle fellows, and often fires." Two centuries later this pleasant city was still unpaved, and even two centuries after that very filthy and unsavoury in-doors and out.

Between the epoch of the Black Death and that of our next great Pestilence—the sweating sickness—in other words from 1347 to 1485, a period of nearly 140 years, England suffered something like a score of epidemics,

with their accompaniments of famine and cattle plague. Among these I note one of influenza, one of small-pox, one of puerperal fever, two of bloody flux, and two of epidemic madness ! I must not stop to comment upon these, tempting as some of them are : but in reference to the last, I may raise the question whether the narrative given at page 12 of my first lecture does not justify the belief that the physical causes which usually give rise to bodily disease sometimes act directly on the mind.

The *Sweating Sickness*, *Pestilent Sweat*, or *English Ephemera* (for by all these expressive names does Dr. John Caius call it), has a special interest attaching to it, and, considering the remoteness of the period, our information about it is satisfactory and tolerably complete. It occurred once at the end of the fifteenth century, and no less than four times during the first half of the sixteenth, or five times in all. Now the Oriental plague attacked London and England five times, once in 1593, and four times in the first 65 years of the seventeenth century. Of the Plague, then, there were 5 epidemics in 72 years ; of the sweating sickness, 5 in 66 years. But with this coincidence all analogy ceases. The 5 outbreaks of plague were not the only ones ; but the sweating sickness does not seem to have occurred in England before or since ; certainly not as a highly mortal pestilence.

This sweating sickness of the sixteenth century was quite a different disease from the black death of the fourteenth, and the Oriental plague of the seventeenth, between which it was, so to speak, interposed. It did not originate in a foreign country, thence to be conveyed by sea, after attacking other countries and cities, to this ; but it sprang into existence within our own limits (here in England), did not extend to Scotland or Ireland ; and when it showed itself abroad, is alleged (with very rare exceptions) to have attacked only our own people. Nor

was it a contagious disease, in the sense in which the plague was contagious; it did not develope any distinct cutaneous rash, no blains, boils, or carbuncles, no blood-spots, or large hæmorrhages under the skin; its victims were not indifferently men, women, and children, as were those of the Plague, but mainly robust men in the prime of life; its onset, unlike that of the Plague, was, with the rarest exceptions, sharp and quick, and the mortal struggle which lasted for many days in most cases of Plague, was mostly an affair of less than four-and-twenty hours. Then, again, while the Plague consumed two or three years, and never, I believe, less than one, in its progress through the country which it attacked, and spent the greater part of a year, at least, in any great city which it assaulted, this sweating sickness would do its work of destruction, and sweep over a nation in some five months at the outside, and enter and quit a great city like London in as short a space of time as three weeks.

The sweating sickness was not limited to England. It appeared in 1529 in Germany, Holland, Denmark, Sweden, and Norway. But as the sickness of 1528 passed away (according to Caius) in July, and did not show itself in Germany till the same month of the year following, it is obvious that, on the Continent, it was due to the same atmospheric causes and personal habits as here in England: not to contagion.

In giving you an account of this disease, I shall follow the course which I shall adopt in the case of the Plague, and which I prefer wherever I find it practicable. I shall deal with Dr. Caius as with Dr. Hodges; and having extracted from his "*Boke, or Counsell against the Disease commonly called the Sweate or Sweatyng Sicknesse,*" all the good metal it contains, turn to Hecker's and Anglada's account of the disease as it occurred on the Continent, for supplementary information.

But as Lord Bacon, in his "History of Henry VII.," gives a very clear account of the first attack, in 1485, I will make a short abstract of it as a preface to the whole subject. Toward the end of September there began and reigned in the city, and other parts of the kingdom, a disease then new—this sweating sickness. It had a swift course, both in the persons attacked and the time it lasted; for after 24 hours, patients were deemed nearly safe; and it began September 21st, to end before the month of October was over. It was a *pestilent fever*, but not followed by carbuncle, or by purple or livid spots, and it terminated by an *extreme sweat*. It was "rather a surprise of nature than obstinate to remedies," for if it was treated as we should now nurse a common cold, people commonly recovered. But infinite persons died suddenly of it, before the manner of the cure and attendance was known. It was conceived not to be an epidemic disease, but to proceed from "a malignity in the constitution of the air, gathered by the predispositions of seasons; and the speedy cessation declared as much."

The sweating sickness showed itself for the first time in the year 1485, soon after August 7th, when Henry VII. arrived at Milford Haven from France; and it continued during the remainder of the month, and through all September. Caius gives us a vivid notion of its severity, when he says of those whom it attacked that it fearfully invaded them, furiously handled them, speedily oppressed them, unmercifully choked them; and that in no small numbers, many of them being persons of rank and mark. It immediately killed some in opening their windows, some in playing with children in street-doors, some in one hour, many in two, and, at the longest, "to them that merrily dined, it gave a sorrowful supper." "As it found them, so it took them," some sleeping, some waking, some in mirth, some in care, some fasting, some full,

some busy, some idle, and in one house, three, five, seven, eight, or more, or all. So that if the half in any town escaped, it was thought great favour.

This is the account which Caius gives of the disease at its first appearance in 1485. He then gives us the dates and brief particulars of the other attacks. The second was in 1506, the third in 1517, the fourth in 1528, the fifth in 1551. It is this last which doubtless supplied him with the best materials for his book published in 1552.

In this, its fifth visit, it showed itself successively at Shrewsbury, in the middle of April, at Ludlow and other places in Wales, at Coventry and other towns in the south, and at places in and about the way to London. It reached London July 7th, and from the 9th to the 16th, killed 761 persons, and from the 16th to the 30th, 143 more; making in all, 904 deaths, exclusive of deaths not registered on the 7th and 8th. From London the sickness passed on to the East, and then to the North, of England, where it raged till the end of August, when it abated, and at the end of September ceased.

The disease was a fever, followed by a sweat. It set in with pains in the back or shoulder, and in the limbs; with flushes, oppression at the liver and stomach, pain in the head, delirium, and palpitation, followed by a marvellous heaviness and desire for sleep. Then (but this is not very distinctly stated) occurred the profuse offensive sweats, from which the disease derives its name. I infer from the treatment being directed mainly to two points—the promotion of perspiration, and the prevention of sleep—that the natural cure was free action of the skin, the common mode of death by coma. Patients suffering from this disease were very subject to relapses. They had them for the third, or fourth, and even as often as the twelfth time.

And now as to the cause, or causes, of this sweating

sickness. We have to explain, if we can, the curious, but apparently well-ascertained fact, that this disease was limited to England and to Englishmen living abroad, in four out of the five epidemics; also that other fact, equally strange, that the victims of the disease were not old men or children, but robust middle-aged adults, of what Caius calls "hot and moist complexions;" wealthy men living in ease and comfort, or, if of the poorer sort, "idle persons, good ale drinkers, and tavern-haunters." "The laborious, and thin-dieted people," the respectable poor, as we should call them, did not take the disease, or had it favourably.

"The intemperance, or excessive diet of England," which was a scandal to the French, and a reproach among the nations generally, was, in the judgment of our author, the predisposing cause of the disease, by bringing about a state of body favourable to the operation of the exciting cause, whatever that might be. Nor does the fact that the disease did once (in the year 1529) extend to Brabant and parts adjacent, shake his belief; for he groups together England, Holland, and Germany, as countries addicted to an "evil diet," "destroying more meats and drinks, without all order, convenient time, reason, or necessity, than either Scotland, or all other countries under the sun." So powerful and effective was this dietetic predisposition, that neither absence nor flight could preserve our countrymen; for in Calais, Antwerp, and other places in Brabant, it was only Englishmen and persons using the English diet who fell sick. "This disease then, is almost peculiar to us Englishmen, and not common to all men, following us, as the shadow the body, in all countries, albeit not at all times." For such strong and reiterated statements, there must have been some foundation of fact. Gluttony and intemperance, then, as now, were powerful predisposing causes of disease.

Among a people addicted to such excesses we should scarcely expect anything approaching to effeminacy. But yet, Caius accuses his contemporaries of being "unwisely fine and womanly delicate." He complains that "the old manly hardness, stout courage, and painfulness of England," were utterly driven away, and that, in their stead, men had become effeminate, and nice, and not able to withstand a blast of wind; while children, "if they were not all day by the fire with toast and butter, and in their furs, they were straight sick."

Concerning the exciting cause of the disease Caius has little information to give us. He sees that it must be in the air, and he alludes to stinking mists seen to fly from town to town, so offensive morning and evening that men could scarcely abide them.

When he comes to the question of *preservation*, or, as we should now call it, prevention, our author prescribes moderation in diet, with details as to fruits and vegetables which may be taken to prove that such wholesome things were at that time in common use; and also measures tending to insure purity of air inside and outside the dwelling. He would make a "sweet house" by means of sundry odours and perfumes, after having made it clean by removing the rushes and dust, with which, as we know, the floors of the best houses, and even of palaces, were strewn. Juniper berries, or a mixture of myrrh, rose-leaves, and frankincense, were also to be burnt on the coals.

Outside the houses the air was to be improved by filling up ditches, removing carrion, mending with earth muddy and rotten grounds, burying the dead, keeping gutters clean, and sinks and easing places sweet, removing dung-hills and ill-smelling things, drying moist air with fires, and so forth.

Personal cleanliness and well-washed hands and faces

are also commended as great aids to health, and clean clothes and suitable exercises. Men should not go out in the morning fasting; they should smell to scented handkerchiefs, and take, the first thing in the morning, a little mithridatum, or some other harmless and useless confection. Of quack medicines and charlatans from every nation under the sun, of remedies so filthy that he was ashamed to mention them, of the *aurum potable*, and waters the products of six months' continuous distillation, costly in proportion, Caius gives us examples more than enough.

The cure or remedy for the sweating sickness consisted in a four-and-twenty hours' rest, the patients being all the time guaranteed against the slightest exposure of the body or any part of it to the air, and the sweat being rather encouraged than forced. They were to have no food for twenty-four hours, and no drink for five; and special care was to be taken in the 4th, 7th, 9th, 11th, and 14th hours. Clarified ale, with a little sugar, might be given the 5th hour, and sweating, if not sufficient, was to be encouraged by frictions and warm drinks. For delirium he prescribed rose water and vinegar to the nose; and if the patient slept or fainted he was to be beaten, scolded, and pulled by the ears, nose, or hair. He was not to be allowed to sleep till he had no desire to do so: this rule to be broken only under the advice of a learned man in physic. This strange treatment we shall see was adopted by Hodges in the Plague.

I have not, I believe, omitted anything interesting or important from this book of Dr. Caius. You have before you a rude and imperfect sketch of a disease wholly unlike the Oriental Plague, and yet having all the attributes of a great epidemic. Bred in England, nursed by English habits and modes of life, largely prevailing among the adult population, and destroying many of those whom it attacked in an incredibly short space of time, making but

a short stay in any one place ; such is the sweating sickness of the sixteenth century. Caius's account I have said is imperfect ; but Hecker is able to supply its defects from other sources, English and German.

Among the *symptoms* he mentions a livid and bloated countenance, great difficulty of breathing, vomiting, intense thirst, convulsions, and a whining and sighing voice ; and diarrhœa in some cases after the worst symptoms had subsided. The occasional occurrence of death before the appearance of the characteristic sweat, as sometimes happens in plague and cholera, is also noted ; and we are told too that convalescent patients remained very feeble for a week or so, and that few stirred out till the second or third day.

Of the *antecedents* and *causes* of the disease Hecker gives an abundance of details. We learn that the first, third, fourth, and fifth attacks were all very severe ; the second exceptionally mild ; that the first, fourth, and fifth were preceded by great inundations, and the fourth attended with great scarcity of provisions ; that as the first outbreak of 1485 was traceable to the army of freebooters and mercenaries who fought at Bosworth, so the third of 1517 took place in London, crowded with foreign artisans from every country in Europe ; while the fourth of 1528 coincided in point of time with the great military operations of Francis I., and his allies in Italy and before Naples. Nor were there wanting in these epidemics, and especially in the last of them, atmospheric disturbances, and unusual developments of the lowest forms of life. There were floods and storms ; and in Germany mould-spots reappeared on clothes, and red discolorations of water.

Among the *predisposing causes*, in other words, the conditions that had prepared the bodies of men to receive this peculiar infection from the air, the diet and mode of life of the robust adult population of England receive, at the

hands of Hecker, as of Caius, due attention. I will follow their example, and will try to represent to you the English as they then lived. I will first read an abstract of the often quoted letter of Erasmus to the physician of Cardinal Wolsey. He grieves and wonders that Britain had for so many years been afflicted with a continual plague, and chiefly with the sweating-sickness, a malady that seemed almost peculiar to it; and he thinks that it might be freed from the disease by reforming its buildings. He finds fault with the aspects of the houses, and the construction of the sitting-rooms, in which great parts of the walls were filled with plates of glass that admitted light but excluded air. He tells us that the streets were generally covered with clay and rushes, which sometimes remained undisturbed for twenty years, concealing a mass of filth not fit to mention, and exhaling a vapour not wholesome for the human body. This ancient collection of filth was doubtless nothing less than the successive contributions made by the houses themselves; for from another letter by the same hand we learn that "the floors of the houses generally were made of loam strewed with rushes, constantly put on fresh, without removing the old, lying there in some cases for twenty years, concealing fish-bones, broken victuals, and other filth, and impregnated with the urine of dogs and men. The existence of this nauseous state of things is confirmed by Caius's directions for fumigating rooms, which were to be put in practice after the removal of rushes and dust. It is easy, therefore, to credit Erasmus when he says, "If, even twenty years ago, I had entered into a chamber which had been uninhabited for some months, I was immediately seized with a fever." Erasmus then notices the fact that many parts of England were marshy and intersected by salt streams, and that the common people were amazingly fond of salt food. To make our island and people healthy he recommended the

disuse of rushes, the building of chambers so as to be exposed to the heavens on two or three sides, glass windows made to open and shut, a more sparing diet, and more moderate use of salt provisions, and the appointment of officers to keep the roads more free from nuisances. All this Erasmus writes in no carping spirit, for he loved the country that had so long given him an hospitable abode; and would willingly spend the remainder of his life there.

But this letter of Erasmus gives us only an imperfect idea of the Scythian filth of human dwellings, and the coarse, unwholesome habits of life among our ancestors at the time that the sweating sickness prevailed amongst them. The tributaries of the Thames were large filthy streams, bearing boats, ships, and even "navies" on their foul, reeking bosoms. What their condition must have been at that time, we may infer from the well-known lines in the *Dunciad*, written early in the eighteenth century:—

"To where Fleet ditch, with disemboгуing streams,
Rolls the large tribute of dead dogs to Thames,
The King of Dykes! than whom no sluice of mud,
With deeper sable blots the silver flood."

These tributaries of the Thames were, I should think, much in the state of the water surrounding the notorious Jacob's Island, in the middle of this nineteenth century, when the same filthy stream served the common purpose of sewer and water-supply; and so prepared its wretched neighbours for the visitation of the cholera.

As to diet and clothing, we are able to collect this additional information. Both high and low were addicted to intemperance; and this English vice passed into a proverb in foreign parts, as appears from a passage in Milton's *Areopagitica*, in which he speaks of "household gluttony" as a "national corruption, for which England hears ill abroad." Flesh meats, highly seasoned with spices, were eaten to excess, strong wine was drunk early

in the morning, and noisy nocturnal carousings were customary. English cookery was wholly wanting in refinement, and pot-herbs were scarce. The clothing of the period was immoderately warm, and the head was covered with thick caps, of which the inner one, of velvet or satin, was close-fitting. Hot baths also were much in vogue, and diaphoretic medicines were prescribed in most disorders. Soap was little used, and linen was dear.

It was by such habits and customs that our ancestors prepared themselves as fitting victims of a disease characterized by profuse sweating. We have but to suppose exceptional weather, heavy falls of rain and consequent inundations; a certain "epidemic constitution" of the air, large gatherings of soldiers or civilians, and a nation of gluttons and drunkards living in filthy, unventilated houses in squalid, noisome streets, with their persons steaming in hot and uncleanly clothing, to be prepared for any conceivable amount of sickness and mortality.

And now we come to ask ourselves this question—was the sweating sickness that visited us five times in the fifteenth and sixteenth centuries, a disease *sui generis*, or was it only an extreme degree of an epidemic with which in still earlier and in later times, we have been familiar? Hecker discusses this question in a chapter headed, "Form of the Disease;" and he arrives at the conclusion that the English sweating sickness was "*a rheumatic fever in the most exquisite form that has ever yet been seen in the world.*" If Hecker means by this word *rheumatic* what we mean by the word *catarrhal* (as I have no doubt he does) he is probably right. I may add, that Mead, writing in 1722 of "the same kind of fever," as it occurred in 1713, when it was known as the "Dunkirk Fever," from being brought by our soldiers from that place, describes it as beginning with a pain in the head, and going off in large sweats, usually after a day's confinement.

For my own part, if I were asked to what disease this sweating sickness bears the nearest resemblance, I should say, either to an ague, with a short and faintly marked first and second stage, proving fatal in its first paroxysm, and, if not, running on to three, four, or twelve relapses; or to a modified and specially severe form of influenza, which, when it did not prove fatal, left behind it for some days a state of extreme weakness.

Let us now see whether the second of these alternatives, to which I incline, is borne out by the account which Hecker gives us of the sweating sickness as it showed itself in Germany, Holland, Denmark, Sweden, and Norway in 1529.

One feature of the Influenza, by which it is distinguished from the Plague, and from all contagious epidemics, is the short sojourn it makes in the places it attacks. Now we learn that the sweat continued in Hamburgh only nine days, in Stettin little more than a week, in Dantzic five days, in Augsburg six, in Amsterdam five. Taking what we call sporadic cases into account, it was an affair, at the most, of a fortnight or three weeks.

Another feature of the influenza which the sweating sickness displayed is the simultaneous, or nearly simultaneous, outbreak of the disease over a wide region or circuit of cities. Now, the Sweating Fever broke out at the same time (in the beginning of September) at Stettin, Dantzic, and other Prussian cities; at Augsburg, far to the south on the other side of the Danube; at Cologne on the Rhine; at Strasbourg, at Frankfort-on-the Maine, at Marburg, at Göttingen, and at Hanover. It took possession of these cities "as it were by a magic stroke," "like a violent conflagration, which spread in all directions," the flames "rising up everywhere, as if self-ignited," and while this occurred in Germany and Prussia, the same thing was happening in Denmark, Norway, and Sweden,

perhaps also Lithuania, Poland, and Prussia. As to the period during which this disease continued to attack the nations of the Continent, we have reason to believe that it did not exceed three months. It then "disappeared everywhere without leaving behind it any sign of its existence, or giving rise to the development of any other disease." And it did not interfere with the "French Hunger Fever," or the "Italian Petechial Fever."

If then the two characteristics of shortness of sojourn and simultaneous attack may be said to belong to the influenza, they certainly did belong equally to this sweating sickness; and I may add that the small aggregate of deaths (probably not exceeding 1200, or, at the outside, 1500, in London during three weeks)—small when we consider the violent way in which it seized many of its victims—is quite in harmony with what we know of the disease in our own day.

The influenza, I may add, was one among the many epidemics that have made the sixteenth century memorable in the history of disease. "It was," to use Hecker's words, "*a century* of putrid malignant affections; a century replete with grand phenomena affecting human life." So that what the same author says of the English Sweating Sickness of 1517 and 1551—namely, that it "made its appearance, not alone, but surrounded by a whole group of epidemics, called forth by general morbid influences of an unknown nature," is certainly true of the three other visitations, and notably so of the epidemic of 1528.

The principal epidemics to which allusion is thus made were the Influenza; the Petechial Fevers of Italy, France, and Hungary; the *Hauptkrankheit* or Encephalitis of France and Germany; the *Trousse-Galant* of France; the epidemic flux, the epidemic scurvy, and the diphtheria.

I shall give such a brief account of each of these as

may serve to fill up the epidemic history of the sixteenth century.

Of the *Influenza* I shall have to speak more at large on a future occasion. It is fully treated of in the "Annals of Influenza," edited by Dr. Theophilus Thompson for the first Sydenham Society, by Dr. Robert Williams, in his work on Morbid Poisons, and by Hecker. It has a special interest for the reason that influenzas are usually only "*the first manifestations, but sometimes also the last remains of extensive epidemics.*"

By a curious coincidence, there occurred in the course of this sixteenth century, 5 notable epidemics of influenza, as there were 5 of sweating sickness in the fifteenth and sixteenth, and 5 of plague in the sixteenth and seventeenth. The dates of the outbreaks are 1510, 1551, 1557, 1564, and 1580. But we have notices of the same disease as occurring in the fifteenth century—in France in 1411 and 1414; also in Ireland at a period not stated. It was in 1414 that the French christened this disease *Coqueluche*, or *the Monk's hood*, from the head-gear to which it compelled the people to resort. The symptoms were those of a common cold—pains in the head, back, and loins; fever, often attended with delirium; nausea and loathing of food; watering at the eyes; hoarseness and cough; and at last disagreeable eruptions about the mouth and nostrils, or bleeding from the nose, profuse perspiration, or diarrhœa. The disease was more remarkable for the number whom it attacked than for the deaths it occasioned. But it is probably an exaggeration to say that it was "unattended with danger." It prevailed in those earlier, as in these later times over an immense extent of territory. The *Annals of Influenza* contain notices and detailed accounts of epidemics, twenty in number, from the year 1510 to the year 1837.

This is all that I deem it necessary to say at present of

this disease, which links together in so interesting a manner, the past and present of epidemic history.

Petechial Fever.—This epidemic seems to have been first seen in Spain in 1490. It broke out in Granada, “where it threatened to annihilate the army of Ferdinand the Catholic.” But the first epidemic of which we have a good description, occurred in Italy, in 1505, nearly simultaneously with the second sweating sickness here in England. Fracastoro, an eminent Italian physician, describes it as a contagious disease, less readily communicated by the person, and by clothes, than the bubo-plague, and chiefly to those in immediate attendance on the sick. The early symptoms were slight and obscure. There was weariness, as after great exertion, but not much heat of surface. The patients lay on their backs, with cerebral oppression, and blunted sensibility; and in most cases muttering delirium, with bloodshot eyes, set in from the fourth to the seventh day. The urine, clear and copious at first, became red and turbid; the evacuations were putrid and offensive; the pulse was slow and small; there was little thirst, but a loaded tongue; a lethargic state in some, great restlessness in others. On the fourth day, or on the seventh, red or purple spots, like flea-bites, or lentils, broke out on the arms, back, and breast; and on the seventh or fourteenth, and in some cases later, the disease came to its height. It was most fatal to children and young people, especially among the higher ranks. This same fever, in a very malignant form, in the year 1528, the date of our third outbreak of the sweating sickness, extended throughout Italy, and followed Italians abroad; and there is reason to believe that it attacked the troops of the French and their allies at the disastrous siege of Naples.

And lastly, in the years succeeding the fifth outbreak of the sweating sickness, in 1551, as well as in the years

preceding it, this petechial fever seems to have prevailed in the armies of the Continent. It is thought to have attacked the imperial troops in 1547, and the Hungarians in their camp near Komorn, in 1566.

This fever seems to have been much mixed up with the Oriental Plague, and often confounded with it in the sixteenth century; and under the name of "spotted fever," figures in our London Bills of Mortality of the seventeenth century. It has become naturalized in England, as one form of the typhus of modern times.

The *Hauptkrankheit*, or *Brain Fever*, seems to have shown itself both in France and Germany—in France in 1482, after a two-years' scarcity; in Germany in 1517. The disease, as it occurred in France, was an inflammatory fever with delirium, and attended by such intense pain in the head, that many dashed out their brains against the wall, or rushed into the water; while others incessantly rushing to and fro, died in the greatest agony. The same disease scourged the north-west of Germany, as far as the shores of the North Sea, at or about the same date. We have no details by which to judge of its fatality.

The *Trousse-galant* of France, named from the speedy death it inflicted on young and robust men, followed fast upon the disasters of the French army before Naples, in 1528; and was the contemporary of a long and grievous famine, being carried about from place to place by the starving people in search of food. These people, it is said, were so saturated with the poison of the disease, that they communicated it to persons in health without being themselves affected; in this respect reminding us of our own jail fever, and of the fever that followed the Irish Famine. It was very inflammatory, often destroyed its victims in a few hours, and left those who recovered deprived of their hair and nails. The disease returned in

1545-6, and spread over Savoy and the greater part of France. The great French surgeon, Ambrose Paré, witnessed this second outbreak. The brain and nervous system were severely attacked, and headache followed by stupor, or extreme restlessness and delirium, were leading symptoms. In most patients, eruptions, not exactly described, but probably petechiæ, showed themselves. The disease often terminated on the fourth or the eleventh day. Large quantities of thread-worms were discharged. It was eminently contagious, and was followed soon after by the true bubo-plague. It is thought to have been the same disease as the *Dandy Fever*, which prevailed in the West India Islands in 1828; and also in recent times, in France.

The *Epidemic Flux*, which was probably dysentery, and not cholera, prevailed over great part of Europe in the cold summer of 1538. Scarcely a town escaped. Two years before this date (July 12, 1536), Erasmus died of it. We have no satisfactory account of its symptoms.

The *Epidemic Scurvy*, so generally associated with epidemic dysentery in modern times, seems to have been very prevalent in the sixteenth century. It occurred in Germany, Portugal, Ireland, and other countries in 1496, and in Denmark in 1536, and 1557. I shall have to speak of it again when I come to the prevalent diseases of the eighteenth century.

Diphtheria or *Diphtherite* is evidently to be counted among the prevalent and fatal epidemics of the sixteenth century. It broke out in Holland in January, 1517, and was, therefore, contemporary with our sweating sickness of that date. It was an infectious inflammation of the throat, which often destroyed life in less than twenty-four hours. It set in with symptoms of cold, soon followed by inflammation of the air-passages, and this by inflammation of the lungs, with high fever. Those who ultimately

recovered got well slowly. The disease appears to have made a very sudden onslaught, and to have passed away in the short space of eleven days. But it spread beyond the limits of Holland, and certainly to Basle, in Switzerland, where in the space of eight months, it killed 2000 people. Here its symptoms appear either to have been more strongly marked or better described. For we learn that "the tongue and gullet were white, as if covered with mould," and that part of the treatment consisted in removing this "viscous white coating" every two hours, and smearing the tongue and fauces with honey of roses. This fatal epidemic broke out again in October, 1557, at Alkmaar, where it destroyed 200 people in a few weeks, and laid more than 1000 people on their backs in a single day. It lingered longer than on its first outbreak, and was certainly less severe.

The diseases which I have just passed in review as being prevalent in Europe at or about the times when our Sweating Sickness was afflicting us,—the Influenza, the Petechial or Spotted Fever, the Brain Fever, the Trousse-Galant, the Epidemic Flux and Scurvy, and Diphtheria, were not the only maladies of this pestilential century. Syphilis, which was certainly known in England as early as the middle of the twelfth century, prevailed in the sixteenth to a degree of which we have happily now no experience, and cannot easily form any clear conception. Small-pox, Scarlet Fever, Measles, and Erysipelas were also then in existence, and often contributed their quota to the frightful mortality of the period.

The last attack of Sweating Sickness in England, in 1551, brings us to the middle of the sixteenth century. Towards the end of it we encounter the first of the five epidemics of the Oriental Plague, of which we possess satisfactory accounts.

The sanitary history of the last half of the century is

not without its interest. In the year 1555, for instance, we are told of Febrile Diseases as being prevalent among us—"hot, burning fevers," which, with other strange diseases, ran into the year following, consuming "much people in all parts of England," and proving fatal, between the 20th of October and the end of December, to "seven grave aldermen in the City of London, and among them Sir John Gresham." In 1563 famine and disease destroyed 20,000 people in London; 1565 is marked by a succession of diseases, Small-pox, Measles, and Malignant Sore Throat. In 1574 there was a pestilence. In 1577, we have the first distinct notice of the Jail Distemper, of which I shall have much to say hereafter, in the notorious Black Assize at Oxford. We have earlier notices of it in 1414 and 1512. In 1583, there was an epidemic dysentery. To pass from land to sea: in 1585, Sir Francis Drake's expedition lost about 700 men, who, for the most part died of calentures. 1586, again, was the date of a great outbreak of the jail distemper at Exeter. In 1592, as I have just stated, we were visited by the Plague; and the year 1599, like the year 1499 of the previous century, was marked by a bad pestilence, of what kind does not distinctly appear. Thus ended this century of epidemics, with its four attacks of Sweating Sickness, as the central figure among the many pestilences which scourged our own and other countries.

It is impossible to read the history of this eventful century without being struck with the frequent occurrence of all those phenomena in the natural world, which tend most to create "distress of nations and perplexity." As we read the pages of Hecker, or such a chronological summary of plagues and pestilences as is to be found in Dr. Short's work, we grow literally bewildered with the repeated references to earthquakes, inundations, droughts, violent storms of rain and hail; comets and fiery meteors;

to blights, mould spots, blood-coloured rain, fogs and stinking mists, to hosts of caterpillars and swarms of locusts; to inverted and distorted seasons, warm winters and inclement summers; to famines, murrains, and fish rendered unfit for food. Add to these, diseases in so many forms, strange and terrible, the gathering and disbanding of hosts of mercenary troops, sieges with their inevitable accompaniments of scarcity and disease, battles, with their slaughter and dispersion of sick soldiers to carry disease with them far and wide, and we have a picture of a state of things hard to parallel in any earlier or later times. But we must not forget that this century, if it scourged us with famine and pestilence, and frightened us with earthquakes and tempests, gave us our English Reformation, our triumph over Spain, and the great names of the Elizabethan age.

In my next lecture, I shall treat of the *Plague*.



LECTURE IV.

THE PLAGUE.

THE Black Death, or great mortality, of the fourteenth century, was undoubtedly the same disease as the Plague of which I am now to speak, differing only in degree, not in kind. They had contagion for their common property, the bubo for their common sign, a frightful mortality for their common consequence.

But as, in the fourteenth century, we had no Bills of Mortality, and no Census of Population, we know nothing of the progress of the disease from week to week, and little for certain of the destruction of life it occasioned. The epidemic of 1499 found us in the same destitution as to reliable facts, and left us in the same ignorance. But the visits of the Plague in the sixteenth and seventeenth centuries were made under more favourable circumstances. London had its weekly Bills of Mortality, and its estimates of population, and these, though imperfect, were an immense improvement on the guesses of the fourteenth century. I shall not now inquire how far facts collected, compiled, and published, as these weekly bills were, are to be relied upon. I will take the more practical course of using them only for purposes to which I think they are applicable, merely observing, in passing, that, like many other faulty and defective returns, though they may not be strong enough to bear a superstructure of scientific truths, they may yet do good service if we content ourselves with comparing one return with another. This being under-

stood, I place before me the carefully compiled tables of Mr. Marshall, which present at one view the figures for the five recognised plague-years, 1593, 1603, 1625, 1636, and 1665; and I will extract from these figures all the gold I can.

Now the first thing I learn from these figures is that, besides the recognised plague-years, there are many others with entries under the head of plague ranging from 1000 to upwards of 4000 in the year; and, in the summer, from 100 to nearly 400 in some weeks. I find such figures in each of the five years 1606 to 1610, and in each of the eight years 1640 to 1647. I infer, therefore, that the Plague was not only a destructive epidemic in some years, but a leading cause of death in others; and I do not doubt that the disease which the female searchers reported as plague in epidemic years was the same which they returned as plague in ordinary years. Captain Graunt, who made a profound study of the facts relating to the Plague, says of the Plague of 1603 that it lasted eight years, and of the Plague of 1636 that it lasted twelve years. Of the outbreak of 1625, on the other hand, he observed that the year preceding only 11 died of the plague, and the year following, 134.

This, too, is obvious at a glance, that while the weeks of the winter quarter present many blanks, and those of the autumn quarter a few, those of the spring quarter have four only, and those of the summer none. And this, again, is easy to perceive, that the figures stand thick in summer and autumn, thin in spring and winter; or, to state the matter more exactly, the seasons, in order of mortality, rank thus:—*summer, autumn, spring, winter*: and I find the same order to prevail in respect of the fatal disease entered as Parish Infection. If now I turn to the five epidemic years, I find that, in them also, the maximum of deaths invariably took place in the summer quarter, and

in four out of the five towards the end of it; and this is true whether the Plague set in early in the year or later. I now turn to Mr. Marshall's table for information as to the rise, progress, and fall of the five epidemics. In 1593, the first cases (three in number) were registered for the week ending March 14, the maximum (983) was reached in 20 weeks, and in 20 more the number had fallen to 39. The Plague must have reached onward into the following year, but for that we have no returns.

In 1603 the first return was for the same week, and for the same number of deaths; but the maximum was not attained till the end of 26 weeks; and at the end of the 40th week, there was a return of 74 deaths.

In 1625, the first weekly return was of 1 death, in the week ending January 3; the maximum was not reached till the 32nd week; and, after 18 weeks more, the return was *nil*.

In 1636, the first return was for the week ending April 4; the maximum was attained after 25 weeks, and, after 12 weeks more, the return is *nil*.

In 1665, the great and final epidemic, the first return is of 2 deaths for the week ending April 25, the maximum was attained after 21 weeks, and at the end of other 13 weeks, the deaths were still 281. So that we must look for a continuance of the Plague far into the next year—the year of the great fire. Let us now compare the figures for these five plague years, and see how many deaths occurred within the years in the winters or springs of which they severally set in. These figures are as follows:—1593, 11,503; 1603, 36,269; 1625, 35,417; 1636, 10,400; 1665, 68,596.

Hence it appears that the first and fourth outbreaks were the least severe; the second and third, of about equal, but more than threefold severity, and the fifth and last by far the most fatal. And the five epidemics hold

the same relative position, if we test their severity by their maximum weekly returns. The figures for the five epidemics are 983, 3035, 4463, 796, 7165. According to both these tests of severity, the fourth attack, in 1636, was the mildest, the fifth attack, in 1665 (thirty years later), of nearly seven-fold severity. The Bill for 1666 has this very significant entry:—

“In the 97 parishes within the walls of London, from the 19th of December, 1665, to the 28th of August, 1666,” deaths by the Plague, 284, “since which time the late dreadful Fire hath consumed and laid waste 81 parishes.”

As up to the end of December the remnant of 16 parishes yielded only 4 deaths, 1994 deaths must have all occurred in 14 parishes, out of the 16 without the walls which the fire had spared, in the 12 out-parishes in Middlesex and Surrey, and the five in the city and liberties of Westminster. But London does not seem to have been absolutely free of the Plague till the year 1680.

I have just said that the fourth attack of plague was the least, and the fifth the most, severe. Let it, however, be understood that I have not taken into account that very necessary element in such comparisons, the number of the population.

As to the mortality due to the Plague, we must, I believe, rest satisfied with the somewhat rude estimate of Sir William Petty, who says “that the plagues of London do commonly kill one-fifth part of its inhabitants.”

There is one feature of the Plague which I have not yet noticed, and that is its occasional strange fluctuations, or, as Graunt calls them, its “sudden jumps,” “leaping in one week from 118 to 927; and back again from 993 to 258; and from thence again, the very next week, to 852.’

From our examination of the Bills of Mortality, then, we have learnt:—

That in 72 years (from 1593 to 1665) we had 5 outbreaks of the Plague, or about 1 every 15 years.

That these outbreaks continued 1, 2, 8, or 12 years.

That they began in winter or spring, and reached their climax in summer.

That they attained this climax in from twenty to thirty weeks, and passed away or sensibly abated in from twelve to twenty weeks; so that, speaking roughly, out of five periods of time, three would be taken up in attaining the maximum, and two in the fall.

That if we place the four seasons in the order of mortality, beginning with the highest, they stand thus:—*summer, autumn, spring, winter.*

That if we measure the severity of the five outbreaks by the deaths in the year in which they set in, or by the greatest number in any one week, but taking no account of population, the first and fourth were least severe, the second and third more severe, and the fifth the most fatal, both absolutely and relatively to any possible increase of population.

That the mortality due to the Plague may be taken at one-fifth of the inhabitants.

Let us now turn to the facts recorded for the year of the great Plague, 1665, and see whether we can learn anything more by studying them.

We have already seen that the Plague first showed itself on the 25th April by two deaths, that it attained its acme, September 19, when it claimed 7165 victims; that by the end of the year the deaths had fallen to 281; but that, though the great fire of the year following destroyed no less than 81 parishes within the walls and 2 without, 1998 deaths occurred in that year, and that even then it was not extinct.

If we count all the deaths from its outbreak in 1665 to its final disappearance, we have a grand total of 70,676.

But I believe this by no means represents the full severity of the epidemic ; for I find that, when the deaths due to the Plague are taken away from the total deaths of the year 1665, there remains a number of deaths little short of 10,000 in excess of the deaths for the previous year (itself the most fatal to life of a long series). These deaths in excess I attribute with great confidence to the Plague ; for I see in the way the epidemic was dealt with, and especially in the harsh measure which caused infected houses to be shut up, the strongest possible temptation to set down to other causes the deaths due to the Plague. And this conviction is strengthened if I examine the causes in detail. Thus, I find an excess of 1813 over the previous year under the head of spotted fever, of 1299 under that of ague and fever, and of 130 under such headings as imposthume and abscess, sores and ulcers. Then fright and grief figure for 117 deaths. Even consumption, a most uniform cause of death, shows an impossible increase of 1163, and surfeit (whatever that may mean) of 1007. Take all the entries in excess under the heads of diseases that attack adult men and women, and they yield a total of nearly 8500.

The other items of increase are very interesting. More women died in child-bed, or suffered abortion by 469 ; and more children perished by teething, convulsions, rickets, and canker, to the number of 1670. This last number in part represents an indirect consequence of plagues and pestilences, and indeed of all deaths and diseases among young adult women ; I mean the neglect of infants and young children. This is the educational aspect of Plagues and of Preventible Diseases.

May we not, then, take credit for something short of 10,000 extra deaths ; at least for such a number as will raise the 70,676 deaths by Plague to 80,000 ? I think we may.

I now turn for a more exact account of the Plague of

1665 to the work of Dr. Nathaniel Hodges, a Fellow of the College of Physicians, resident in the City, and as his book shows, in active practice among the victims of the disease.

Dr. Munk, in his Roll of the Royal College of Physicians of London, says that he "acquired a great name, among the citizens of London, that he remained at his post and continued in unremitting attendance on the sick," and that, "during the latter part of his life, he received a regular stipend from the City of London, for the performance of his charitable office."

Dr. Hodges tells us that about the close of 1664, two or three persons died suddenly with symptoms of the Plague in one family at Westminster, that some timid neighbours of theirs took fright and removed into the City of London, carrying the taint of the pestilence with them; whereby the disease, which existed only in a family or two, gained strength, and spread abroad; and "for want of confining the persons first seized with it, the whole city was in a little time irrecoverably infected."

In December a hard frost set in, which lasted three months, and during that time very few died of the plague. But the disease was not extinguished; for in the middle of the Christmas holidays, the doctor was called to a young man in a fever, who after two days "had two risings about the bigness of a nutmeg," "one on each thigh," with a "black hue" and a "circle round them." By these and subsequent symptoms, he judged it to be a case of Plague. It did not prove fatal.

When the frost broke, the disease gained ground, and extended into several parishes; and the authorities issued an order "to shut up all the infected houses," so as to prevent ingress and egress. To give effect to this order, the houses of the infected were to be marked with a red cross, and to carry the inscription, "*Lord have mercy upon*

us ;" and a guard was set, whose duty it was to hand food and medicine to the sick, and to prevent them from going abroad till forty days after their recovery. In spite of these harsh measures, "the Plague more and more increased." Nor will this surprise us if we imagine the frantic and successful efforts that must have been made by the non-infected to escape, and the temptation to servants and nurses to appropriate and remove the property of the dying and dead. Indeed Dr. Hodges accuses the nurses of strangling their patients, and secretly conveying the pestilential taint from sores of the infected to those who were well ; and he justifies his accusation of "these abandoned miscreants," the Gamps and Prigs of the seventeenth century, by two instances ; the one of a nurse who "as she was leaving the house of a family, all dead, loaded with her robberies, fell down dead under her burden in the streets," the other of a "worthy citizen," "who being suspected dying by his nurse, was before-hand stripped by her ; but recovering again, he came a second time into the world naked."

In spite of the well intentioned measures of the authorities, the Plague continued through May and June with more or less severity, sometimes in one place, sometimes in another, till the people, becoming thoroughly frightened, flocked out of town in crowds. But the disease raged with redoubled fury among those that remained. Then the authorities bestirred themselves to the utmost. They instituted a monthly fast ; and the King commanded the College of Physicians "to write somewhat in English," that might serve as "a general directory." The College not only obeyed the royal commands, by inventing a "*Plague Water*," consisting of a cordial distilled off from a vinous infusion of a score of very harmless roots, leaves, and flowers, but also appointed two of their number to co-operate with two chosen from among the aldermen in at-

tending the infected ; while Dr. Glisson, Regius Professor at Cambridge, and Drs. Paget, Wharton, Berwick, and Brookes volunteered their help, with many others who survived, and eight or nine who fell victims to their self-devotion, among whom Dr. Conyers receives honourable mention.

Still, in the face of every precaution, the Plague continued its work of destruction, especially among the common people, so as to be called the "*Poor's Plague* ;" and, in August and September, completely got the mastery, "so that three, four, or five thousand died in a week, and once 8000."

And here I will follow Dr. Hodges' example ; and try to give you some idea of the state of things then prevailing. But, in doing so, I must shorten and tone down his description. "In some houses," he says, "carcasses lay waiting for burial," "in others, persons in their last agonies." "In one room might be heard dying groans, in another the ravings of delirium," and, near at hand, relations and friends bewailing their loss and their own dismal prospects. "Death was the sure midwife to all children, and infants passed immediately from the womb to the grave." Some of the infected ran about staggering like drunken men, and fell down dead in the streets, or they lay there comatose and half dead ; some lay vomiting as if they had drunk poison ; and others fell dead in the market in the act of buying provisions. The plague spared "no order, age, or sex." The divine was taken in the very exercise of his priestly office, and the physician while administering his own antidote ; and though the soldiers retreated, and encamped out of the city, the contagion followed, and vanquished them. Many in their old age, others in their prime, most women, and still more children, perished, "and it was not uncommon to see an inheritance pass successively to

three or four heirs in as many days." There were not sextons enough to bury the dead, the bells ceased tolling, the burying places were full, so that the dead were thrown into large pits, dug in waste ground, in heaps, 30 or 40 together; and those who attended the funerals of their friends one evening, were often carried the next to their own long home.

This is written of a time when the worst had not yet happened. It was about the beginning of September that the disease was at its height. Then fires were ordered to be burnt in the streets for three days together; but, before the time had expired, they were extinguished by heavy rains, which ushered in the most fatal night of all, with its register of more than 4000 deaths.

From this, its culminating point, the Plague, "by leisurely degrees declined," "and before the number infected decreased, its malignity began to relax, inso-much that few died, and those chiefly such as were ill-managed." Dr. Hodges distinctly states that the pestilence did not stop for want of subjects, but from the nature of the distemper. "Its decrease was, like its beginning, moderate." Early in November, people grew more healthful, and though the funerals were still frequent, "yet many who had made most haste in retiring, made the most to return;" "insomuch that in December, they crowded back as thick as they fled." The houses were again inhabited; the shops re-opened; the people went cheerfully to their work; the rooms, in which a short time before infected persons had breathed their last, were peopled afresh, and many went into their beds "before they were even cold, or cleansed from the stench of the diseased." "They had the courage now to marry again," "and even women, before deemed barren, were said to prove prolific, so that, although the contagion had carried off, as some computed, about 100,000, after a few

months, their loss was hardly discernable." But the next spring there appeared "some remains of the contagion," which was easily conquered by the physicians; and the whole malignity ceasing, the city returned to perfect health, as, after the great fire, "a new city suddenly arose out of the ashes of the old, much better able to stand the like flames another time."

So much for the Plague in London. But the city became the focus of "infection to surrounding districts, and, even, as I shall presently show, to remote places. We are told that the citizens who crowded into the adjacent towns, carried the infection with them, so that the Plague reigned over whole counties, leaving hardly any place free, attacking with extreme violence the towns on the Thames, not even sparing places "of the most advantageous situation for a wholesome air." It was not, as Hodges thought, the fault of the moist air of the river, but of the tainted goods that were carried upon it.

I have just stated that the Plague was conveyed from London even to remote places. I may add that it was not by personal intercourse only, but also by goods and merchandize. Of this latter mode of communication, we have an admirable and most instructive example in what befell the inhabitants of Eyam, in Derbyshire, a place rendered for ever memorable by the heroism of its rector, Mompesson.

Eyam, a hamlet secluded among the hills of the Peak of Derbyshire, is about 150 miles from London, and had a population of 350 souls. Quite early in the month of September, when the Plague was at its worst in London, there was sent from London to one George Vicars, a tailor, a box of clothes. He opened the box, and hung the clothes to the fire; and, while he watched them, was suddenly seized with violent sickness, and other alarming symptoms. On the second day he was worse; was deli-

rious at intervals, and large swellings appeared on his neck and groin. On the third day, the plague spot was on his breast, and he died the following night, the 6th of September. The disease spread from this centre; by March 1st, 1666, had destroyed 58 souls; and, by the beginning of June, 77, or more than one in five of the population. About the middle of June, the Plague began to increase; and then it was that Mrs. Mompesson, the rector's wife, implored her husband to remove, with herself and their two young children, from this doomed village. But he, alleging his duty to his suffering flock, and his responsibility to his Maker, and pointing out the stain which would rest on his memory did he desert his post in this hour of danger, determined to remain. He, on his part, tried to persuade his wife to take their children with her to some place of safety till the Plague should be stayed. But she declared that nothing should induce her to leave him alone amidst such ravages of death. Her children, however, she would send away. It was at this time (about mid June) that the inhabitants, wishing to follow the example of the few wealthy who had left early in the spring, and of a few others who had built huts for themselves in the neighbourhood, would have deserted the village *en masse*. But now Mompesson, with his own example, and that of his wife to back him, pleaded so effectually the selfishness, and the uselessness of such a course, the danger to the neighbourhood, the slight chance of profit to themselves, that the inhabitants were induced to give up all thoughts of flight. Mompesson, then, concerted measures with the Earl of Devonshire, who remained at Chatsworth during the Plague, and with his assistance established and carried out an efficient quarantine.

A circle was drawn round the village, at a distance of about half a mile, beyond which no inhabitant should

pass; and to two or three chosen spots, provisions were brought every morning, by persons from the neighbourhood, who immediately retired. Men, appointed by the rector, fetched these provisions, and left the purchase-money for the few articles not given by the earl, in troughs of water.

Towards the end of June, "the plague began to rage even more fearfully." There were so many deaths, that the passing bell was no longer rung, the churchyard was no longer used for interment, and the church-door was closed. The rector read prayers and preached from an arch in an ivy-mantled rock, in a secluded dingle, to his people seated on the grass at some distance from each other.

All this time, though Mompesson had been visiting from house to house, he and his wife had escaped. But on the 22nd of August Mrs. Mompesson was seized, and three days after was at rest in the village churchyard. In this terrible month of August there were 77 deaths out of a population of less than 200 remaining at the beginning of the month. At least 2 in every 5 must have died.

The hot month of September proved less fatal; and on the 11th of October the Plague, as if exhausted with excessive slaughter, held its hand. It had attacked 76 families, and swept away 267 out of about 350 inhabitants—say 7 in 9. These are the figures taken from the parish register. Mompesson states the deaths at 259; it is likely, therefore, that 8 died from causes other than plague. The 267 deaths were distributed thus: males, 136; females, 126; infants, 5.

We are not told of the number of attacks that did not prove fatal; but we know that Mompesson's man-servant, and one Marshall Howe, a sturdy daring giant who acted as gravedigger, had the plague and recovered.

In Wood's "History and Antiquities of Eyam," the names and dates are carefully extracted from the register; so that we can follow the Plague by the month and by the week. It lasted thirteen months, from September 7, 1665 to October 5, 1666. In the first month it claimed 6 victims; in the second 23; then for seven months, till the end of May, 1666, it never killed more than 9, and in May as few as 4. In June it resumed its activity, claiming 19 victims; in July the number rose to 56; and in August, when it reached its climax, to 77. In September, there was a somewhat abrupt fall to 24; and in October (when 10 deaths were entered without dates) to 14. I have extracted the deaths according to the names and order of the deceased, and find under the same names cases of 8, 10, 11, 13, and 14 deaths; and, as showing their quick succession in some instances, such figures as these: in a family of Rowses, the 41st, 42nd, and 43rd interments. I find, too, that the second death occurred in the family of the reputed landlord of Vicars, and the third in the house of the next neighbour.

If we count by weeks, we attain the climax about the 44th week, when there were 26 deaths: but its history, both by weeks and months, is one of slow increase at first, of decided progress during the month of October, of a comparative inactivity during seven months of winter and spring, of progressive and rapid increase in the five months of summer and autumn—evidently at Eyam, as in London, a disease much promoted by heat, and greatly checked by cold.

Mompesson, the hero of this sad tragedy, left Eyam in 1669, three years after the Plague had ceased, for a living in Nottinghamshire, where, so fearful were the people even then of the Plague in which he had lived and worked so long, that he was obliged to live in a secluded hut till their fears had died away.

With this tragedy of Eyam are associated two episodes relating to the Talbots and Hancocks, who found their place of interment in the Riley graves. Riley was in an airy situation, a full quarter of a mile from Eyam. On the 5th of July, after the Plague had been in Eyam ten months, Bridget and Mary, daughters of Richard and Catherine Talbot, died, and were buried by the father close to the house. On the 7th he performed the same sad office for his surviving daughter Ann, and on the 18th for his wife. His son Robert died on the 24th; the next day the father followed; and on the 30th another son, the last survivor, who is believed to have been buried by the Hancocks, whom the pestilence then seized. On the 3rd of August John and Elizabeth Hancock died, and were buried near their cottage by their mother; four days later she interred her husband and two other sons. Two days more, and she was digging the grave of her daughter Alice; yet another day, and Ann, her only surviving child left at home, died and was buried. A few days after this Mrs. Hancock left her desolated home to spend the rest of her sorrowful life with her only surviving son. He erected the "Riley Graves," on which the particulars of this terrible history are engraved.

In Wood's work there is the record of a case very like those of the Talbots and Hancocks. It belongs to the Plague of 1625, and occurred at Bradley, in Cheshire. Thomas Dawson, of Bradley, his wife, brother, three sons, a daughter, a man-servant and a maid-servant, died of the plague brought from London, a distance of 170 miles, by one of the sons. The deaths all took place, and the burials are recorded in the parish register, in the interval between July 25 and September 5, a period of forty-two days. These nine persons seem to have made up the whole family. Of Richard Dawson, the uncle, it is alleged that, being a heavy man, and sick of the plague,

he got out of bed, dug his own grave, caused some straw to be thrown in, lay down in it, had his clothes placed over him, and so died.

The history of the "Plague of Eyam" has pathetic passages and images of horror, such as the last walk of the rector and his wife through the fields, when, talking on their usual theme, their absent children, Mrs. Mompesson marks, to the terror of her husband, the sweet smell of the air; or that picture of poor Mistress Hancock, dreading to touch the dead bodies of her husband and sons, but tying a towel to their feet, and so dragging them to their last resting place. It is not, however, as a romance of heroic self-devotion that I have been describing the *Plague of Eyam*, but as an authentic example of plague transported by clothing, infecting a whole village, and being restricted to it and its immediate neighbourhood by judicious and efficient measures of quarantine.

I may mention, in passing, that Dr. Mead, writing in 1722, notices the plague at Eyam, and gives a brief history of it, for which he says that he was indebted to the then rector, the son of Mompesson, and another worthy gentleman.

From Eyam and Mompesson let us now return to London and Dr. Hodges, and see what he has to teach us about the antecedents of this Plague of 1665.

Let us first inquire whether there was anything in the year or times preceding the attack to account for the great destruction of life it occasioned. Did famine or scarcity, the precursors of so many other pestilences, usher in this also? Was there such a want of fruit and vegetables as, by inducing scurvy, or a scorbutic condition, would make men easy victims to the disease? The answer is conclusively in the negative; for Dr. Hodges tells us that the necessities of the poor who were left

behind were relieved "with a profusion of good things from the wealthy, and their poverty was supported with plenty;" that there were open markets and a greater plenty than usual of all provisions, "so that there was the reverse of a famine;" and we are further told that "this year was luxuriant in most fruits, especially cherries and grapes, which were at so low a price that the common people surfeited with them." Of vegetables no special mention is made. These statements are confirmed and amplified in another passage. "Had we," he says, "any famine before the last sickness? or had we portentous swarms of insects like clouds over us?" No, just the contrary; "all things from nature were promising and serene." The only exception I can find to these statements is in a passage where the Doctor says that in the year before the Plague "there was a great mortality amongst the cattle, from a very wet autumn, whereby their carcasses were sold amongst the ordinary people at a very mean price;" but he rightly thinks that a cause so private and particular could not be supposed to extend to so universal an effect. Of any special overcrowding, or unusual neglect of cleanliness in the time preceding the plague no mention whatever is made. In this great pestilence, therefore, we wholly miss the most common and efficient predisposing causes.

As to the exciting proximate cause we are not left in doubt. Dr. Hodges, at least, has no misgiving about it. It was *contagion* and nothing but contagion. We have it, he tells us, "from the most irrefragable authority," that the Plague "was imported to us from *Holland*, in packs of merchandize;" and "by common fame" "it came thither from *Turkey* in bails of cotton or silk." Dr. Hodges deals with the anti-contagionists of his day in this passage. The plague is communicable by contagion, and in "that way only," "killing most it seizes," and "the infection

of the pestilential poison is not only transferable from one subject to another, either by mediate or immediate contact," "but all the conditions likewise of its exertion are as conspicuous as the noon-day sun; wherefore those arguments to prove the pestilential corruption not to arise from contagion are trifling and not worth notice, as altogether disconsonant to reason and experience."

That our author, though he expresses himself in terms strange to us, had yet a very clear view of the whole matter of causation I infer from his enumeration of the four things chiefly necessary to a contagion. There is, first, "an efflux of the *contagious seminium*;" secondly, "a convenient *medium* for the contagious particles to move through and be conveyed by;" thirdly, "a fitness in the subject to receive and cherish the contagious *effluvia*;" and fourthly, "a due stay of this *seminium*."

Of the *seminium*, or matter of contagion, Dr. Hodges does not pretend to have any knowledge; but he discredits those who allege that the infection resembled "the fragrancy of flowers in May," or, "the stench of a rotten carcase." I may, however, remind you that it was his wife's exclamation—"how sweet the air smells"—that struck terror into the heart of the brave Rector of Eyam. Is it not possible that an illusion of the sense of smell may have been sometimes a sign of seizure, as it is occasionally of a fit of epilepsy?

In describing the *symptoms* of the Plague, Dr. Hodges distinguishes such as are signs of infection from such as belong to the fully formed disease.

The *early symptoms* were shiverings, vomiting, giddiness, headache, delirium, and drowsiness—symptoms common to most severe febrile attacks.

The more *advanced symptoms* were fever, restlessness, great heat at the pit of the stomach, palpitation, and bleeding at the nose.

The *characteristic symptoms* were the appearances on the skin, known as *Blains*, *Buboes*, *Carbuncles*, and *Spots*, and certain marks called *Tokens*.

The fever, in some cases, was *continued*, in others, *remittent*, in others, *intermittent*; often attended with intense thirst, and a dry, black tongue. The matters discharged by sweat and urine, by vomiting and purging, were often intolerably offensive. Delirium seems to have been very common, for Hodges says, "all the sick," "quickly after seizure, grew delirious, running wildly about the streets, if they were not confined by force." A severe dysentery was present in some cases, and blood was poured out under the skin in more. Sudden death without warning, deep sleep passing into death, death in a few hours after the appearance of the characteristic signs—such were some of the exceptions to the rule.

Our author seems to have been a close observer of the blains, buboes, carbuncles, *petechiæ*, and *tokens* which were the outward and visible signs of the Plague.

The *Blains* were blisters, from the size of a pea to that of a nutmeg. They began with a sharp, shooting pain; contained a thin, straw-coloured liquid; burst and discharged a corrosive liquid, yellow or black, and were surrounded by a circle, red at first, variegated afterwards. They appeared in many parts of the body, and their number varied in different cases. One woman was covered all over with them. Sometimes they were the first indications of infection, rarely they became inflamed and turned to carbuncles.

The *Buboes* were hard, painful tumours, inflamed and gathering behind the ears and in the armpits or groins; one or two, in favourable cases, very many in unfavourable ones. There might be one in the right arm-pit, another in the left groin. They would sometimes vanish,

especially during a sweat; or they would come and go; or they would suppurate.

The *Carbuncle* began as a *blain*, which, when it broke, became covered with a dead crust, or *eschar*, round which the skin first grew red, then livid, at last black. They might appear anywhere—breast, finger, armpit, groin; two, three, or more at a time; and the matter from a carbuncle would produce another on any part that it touched.

The *petechiæ* were little deep-coloured spots on the skin, like flea-bites without the central spot, not removed by pressure, not large and diffused like scurvy spots, and showing themselves chiefly on the neck, breast, and back, not on the arms and legs. These spots, too, were few or many; might be red, yellow, purple, or black; might cover the whole body; might come and go, and be carried off by a sweat.

The *tokens* were deemed the “pledges or forewarnings of Death.” They were “minute and distinct *blasts*,” or blisters; but they might look like warts. They might be small as a pin’s head, or large as a silver penny. They rose up “with a little pyramidal protuberance,” from which they spread; appeared on the internal parts as well as on the skin; were sometimes hard, sometimes soft, sometimes sensible to the prick of a needle (a good sign), sometimes insensible (a bad one). They were bad signs even when every other symptom seemed favourable; and, *especially when deep, were* “the sure and speedy messengers of death.” Here are two cases in point:—A girl, when first seized, breathed easily, had a natural warmth of surface, an equal and regular pulse. All things were “genuine and well” with her, “as if she had ailed nothing.” Dr. Hodges was even inclined to think her shamming, until, on examining her breast, he found “the certain characters of death imprinted in many places,”

and the following night, "before she herself, or any person about her, could discern her otherwise out of order," she died. The doctor had seen a widow of sixty eating a hearty dinner of mutton and broth; she said of herself that she had "never been better in her life;" but he found her pulse to intermit, and, on examining her breast, he found "an abundance of tokens." She died that evening.

These details will suffice, I think, to give to all men, but especially to doctors, a lively idea of the fatal pestilence of 1665, and of the Plague in all its outbreaks.

In the matter of *treatment*, Dr. Hodges shows himself a man of sense. He speaks doubtfully of bleeding, but denounces large and repeated venæsections, deeming it madness "to sink the necessary strength by a rash effusion of blood," "in order to remove an imaginary fulness," and he says that he had "many times seen the blood and life drawn away together." But he commends the *Virginian Snake Root*, and *Ginger and Spirits of Hartshorn* given in the *Plague Water* of the College of Physicians (a spirituous cordial, as you may recollect); but, above all, he gratefully extols "*the virtues of sack*," in which he seems to have been somewhat of a connoisseur, preferring as best that which is "middle-aged, neat, fine, bright, racy, and of a walnut flavour." This generous liquor is both antidote and remedy, unless for those who use it "too intemperately."

Of other remedies then in repute he speaks with very creditable reserve. Of the virtue of the powder of an unicorn's horn, he is as doubtful as of the existence of the creature itself; but he does not condemn *troches of vipers*, or their *volatile salt*; and he found greater success with troches made of the flesh of the rattlesnake than from the native product. As he commends the native remedy

for its cheapness, vipers must have abounded in those days.

But these, as well as the "*manifold compositions*," which must have indeed consisted of many elements, if they were more complicated than the *Plague water* of the College, or his own *alexipharmick vinegar* or *anti-pestilential confection*, were innocent enough compared to what I may call the regimen of the sick-room; and the same may be said of such local applications as the flesh of pickled herrings to the feet and wrists, and of the bare rump of a fowl, live pigeons, and warm sheep's lights to draw out "*the pestilential venom*" from the boils and carbuncles.

What I have called the regimen of the sick-room consisted in keeping the infected close in their beds the whole time of the disease (tying them in their beds, if delirious); keeping the patient forcibly awake, if drowsy; covering him with blankets to make him sweat; scrupulously avoiding change of body-linen and bed-clothes, because, forsooth, "the patient takes harm by clean coverings," and incurs "the approach of air" by the shifting, because also the fresh things are apt to be damp. The soap used in washing the clothes he acquits of mischief, in which he differs from Diemerbroeck, the Dutchman.

In treating of "*Preservation from a Pestilence*," Hodges also shows himself a man of sense. He would make a timely separation of the infected from the healthy, would forbid public funerals, and all kinds of meetings, and would enjoin quarantine "according to the custom of trading nations." He approved the action of the magistrates in appointing two in every parish to pay a daily visit to every family and see whether they were free from the infection or not. Having noted the good effect of brisk winds, he would stir the air by "the frequent ex-

plosions of great guns, especially morning and evening ;” and he thought that the products of combustion of “an intimate combination of nitre and sulphur” greatly altered “the saline qualities of the pestilential taint.” Hence he approved of fumigation with nitre and resinous woods. He most approved the placing of a chafing-dish in the middle of a room, or in the doorways or windows, and burning in it what he terms “*proper things*,” viz., quick lime thrown into an aromatic liquid, or a paste made of a pound of saltpetre and three ounces of sulphur, melted with benzoin and storax, in quantity sufficient to make, when dried, a suitable mass. This is perhaps his best receipt : “The streets, sinks, and canals should daily be cleared of all filth ; because stench and nastiness are justly reckoned entertainers of infection.” “Dogs, cats, and other domestic brutes,” as carriers of contagion, should be killed. He also shows a proper respect for cleanliness as a measure of prevention, though his treatment of the infected did not, as I have shown, tend to promote it. He says, “I know not, indeed, a greater neglect than in not keeping the body clean, and keeping at a distance everything superfluous or offensive.” Lastly, fasting was to be avoided, a diet nourishing and easy of digestion to be chosen, with pickles and sauces, juice of sorrel, lemons, oranges, pomegranates, barberries, and *sack* at every meal. Tobacco, much praised by Diemerbroeck and others, he does not approve, alleging against it its narcotic qualities, its poisonous oil, its promotion of spittle, and “the irksomeness of its scent.” He is its “*professed enemy*,” and preferred *sack*, in which (though a moderate man myself) I confess that I heartily agree with him. He greatly commends a mixture of which camphor is the active ingredient.

The common people, in Hodges’s day, were much addicted to amulets and charms. They painted their

bodies with hieroglyphics, and carried about their persons a walnut filled with mercury, a paste made with arsenic, or a dried toad ; and some nasty old nurses gave human excreta as antidotes. The arsenical paste, in the case of an elderly lawyer, seems to have determined the spot for a "pestilential carbuncle," and in other instances gave rise to large blisters.

Dr. Hodges finishes his history with a curious account of the regimen he adopted for himself. He kept open an issue which warned him, by a shooting pain and an ill-conditioned discharge, when he ought to have recourse to *alexipharmics*, or poison-antidotes. As soon as he rose in the morning he took his own *Antipestilential Electuary* (which, like the *Plague water* of the College, consisted of a score of harmless simples) to the size of a nutmeg. He then despatched his own private concerns ; and this done, went into a large room, where he spent two or three hours, as in an hospital, among crowds of citizens, some with the first symptoms of the Plague, others convalescent. This work done, he took his breakfast, after which till dinner time, he visited the sick at their own houses. When he entered them, he caused "some proper thing" to be burnt on coals, and kept in his mouth some lozenges while he examined the sick. He took care not to enter the sick-room sweating or panting, and he kept his mind as composed as possible. After some hours he returned home, drank a glass of sack, eat a nutritious meat dinner with pickles, and finished with more wine. Then came many more persons for advice, and further visiting of the sick till eight or nine at night. And he "concluded the evening at home by drinking to cheerfulness of his old favourite liquor, which encouraged sleep, and an easy breathing through the pores at night." If, in the day-time, he had what he deemed "the least approaches of the infection," such as giddiness, nausea,

and faintness, he immediately had recourse to a glass of sack. Yet, in the whole time of the Plague he found himself ill but twice, and soon got better. He is said (probably on the strength of this statement of his) to have had the plague twice. But this, I think, is a mistake.

Such, then, is a faithful account of the Plague of 1665, from one who was an eye-witness from first to last; a well-informed, sensible, industrious, and brave man.

I should not have allowed a disease that has not been seen in England for two centuries to take up so much of our time were it not that it has visited France, Russia, and our own possession (Malta) in much more recent times. It attacked Marseilles in 1720, Moscow in 1771, Malta so late as 1813; and, in each of these cases, after an interval which might well have filled the inhabitants with the confidence that they had seen the last of it. It had not been in Marseilles for 70 years; in Moscow for a century and a half; in Malta for 137 years. We are not justified, then, in asserting that England and London can never again be visited by this formidable disease. I will therefore ask you to give such further attention to this subject of the Plague as this consideration seems to warrant. We have in it a good example of a contagious fever, with buboes and carbuncles for its local expression; of a specific poison seeking its elimination from the system in the skin and lymphatic glands. I speak of the disease as contagious because I find the facts conclusive on that point, and the arguments of such men as Gooch and Robert Williams convincing in the face of the few who have broached the opposite doctrine. I adopt as probably true the estimate of Dr. Williams that the infection may lie dormant, or latent, for as many as twenty-one days. I am also convinced, by the facts recorded by competent and trustworthy authorities, that whole communities and bodies of men, by perfect measures of isolation, have kept free from the

disease, or (as in the case of the village of Eyam) have prevented it from spreading to their neighbours.

These (as I think) are the well-established facts and principles with which sanitary science has to deal; and the question naturally arises, What demand may be made on our knowledge and skill by this or any similarly contagious malady?

Now, we may have to advise and to act in three different contingencies:—1. The Plague may have made its appearance in some city, as in London, in 1665. 2. The Plague may be known to exist in some country with which we have commercial relations. 3. The Plague may have shown itself in Egypt, or some neighbouring country, from which, as in times past, it may threaten to spread.

1. In the first case—that of the Plague having broken out in some city, such as London—it is evident that we could not recommend the cruel expedient of barricading the doors and windows of infected houses, and leaving their inmates to perish; nor could we, in these days, shut up the infected houses, mark them with a red cross and a prayer, confine the healthy in the same atmosphere with the sick, and prevent ingress and egress by a guard, as was done in London in 1665. But what we could do, and what we should be bound to do, would be to appoint skilful and active persons in every parish or district, as it became infected, charge them to make a daily house to house visitation, to examine the sick, and if they were found with the marks of the plague upon them, isolate them to the utmost practicable extent in the houses in which they had fallen sick, or have them removed to some pest-house; and in any case provide for the destruction or purification of clothing, bedding, furniture, and houses, and the immediate disinfection of every matter discharged from the person. Water supply, ventilation, drainage, and the speedy removal of all offensive matters, should

receive prompt and special attention ; and proper food and medicines should be liberally supplied. In a word, each case as it arose ought to be promptly taken in hand and isolated from the healthy to the utmost extent consistent with the proper treatment of it ; while every known sanitary precaution should be taken to destroy the contagious matter as soon as formed.

2. On the second supposition—that the Plague existed in some country with which we have commercial relations—we might be required to advise the Government as to the expediency of establishing a quarantine, with its necessarily complicated machinery. At present I will only remark how troublesome and costly an interference with commerce this measure implies ; how sore a temptation there must be to evade it ; how hard it is to give to it full practical effect. But, on the other hand, how grave a responsibility must that government incur which, with the terrible histories of past plagues before it, and the fact of contagion admitted by the best authorities, should determine to abandon so obvious a precautionary measure. Let us hope that the knot of this dilemma, so hard to untie, may some day be cut by our experience of the efficacy of house to house visitation and prompt treatment, sanitary and remedial, of each case as it arises.

3. On the third supposition—that, namely, of the Plague showing itself in Egypt, or other less common birth-place—it is obvious that the governments of the countries threatened with infection might fairly insist on every known precaution being taken to limit the disease to the first cases that show themselves ; and (what is still more important) on the towns and districts where the Plague is known to prevail being brought into and maintained in the best possible sanitary condition, like precautionary measures being adopted in reference to such occasional gatherings of human beings as war and pilgrimages imply.

LECTURE V.

FROM THE GREAT FIRE TO THE CLOSE OF THE
EIGHTEENTH CENTURY.

WE are now come to our third sanitary epoch, extending from the Fire of London in 1666, to the end of the eighteenth century. It may be conveniently subdivided into three periods, of which the first extends from the Great Fire to the end of the seventeenth century; the second and third embracing the first and second halves of the eighteenth. For our knowledge of the prevalent and fatal diseases of this period of nearly a century and a half, we are indebted to the writings of physicians practising in London, and to the London Bills of Mortality, taken in conjunction with what history teaches us of the results of the Great Fire, and of the progressive changes brought about by increasing wealth, extended commerce, and improved habits of living.

In treating of the first period of thirty-four years we must begin with the Great Fire and the immediate consequences that flowed from it. It broke out on the night of Sunday, September 2nd, 1666. It began on Fish Street Hill and continued to burn "for several days together, till it had consumed everything, from the Tower to Temple Bar." It destroyed 81 out of the 97 parishes within the walls, and 2 of the 16 without the walls. It found the Plague still in possession of the city, though in a very subdued form. The year previous it had swept away nearly 70,000 inhabitants, probably

80,000, possibly more. This year of the Fire 288 only died of it in the 97 parishes within the walls, 574 in the 16 parishes without the walls, 939 in the 12 out-parishes in Middlesex and Surrey, and 197 in the 5 parishes in the City and Liberties of Westminster; in all 1998. Now of this number there died between the Fire in September and the end of the year, 4 in the 16 parishes remaining within the walls, 73 in the 14 left standing without the walls, and a number which I am not able to ascertain in the out-parishes of Middlesex, Surrey, and Westminster. But if the deaths in these out-parishes after the Fire bore to the whole number for the year the same proportion as they did in the parishes without the walls, namely 1 to 8, we should have to allow about 142 deaths; which, added to the other figures, would give a total of deaths from the Plague, in the year *after* the Fire, of 219. At any rate, the Plague must be understood to have survived the Fire in the parts of London which were not burnt. The year following (1667) the Plague is still credited with 35 deaths, and in the subsequent years with 14, 3, 0, 5, 5, 5, 3, 1, 2, 2, 5, and 2, this being the number for 1679, the last year in which any entry under this head appears.

Now let us inquire what sort of a city this was that the Plague haunted and the Great Fire consumed. It consisted, as we learn on good authority, of narrow, crooked streets, many of them unpaved, with drains all above ground, and sewers much neglected, with a very insufficient supply of water. The houses were of wood, lofty, dark, and ill-planned, each storey overhanging the one below; at the same time that enormous sign-boards swung across the street. In this way effectual provision was made against the intrusion of two of the great purifiers, fresh air and sunlight. The inside of the houses was in keeping with the out. The floors, often of clay, were strewed with rushes, or in the case of such grand struc-

tures as the palace at Greenwich, with hay ; and we learn from the letter of Erasmus, to which I have already referred, that in the days of Cardinal Wolsey, though fresh rushes were supplied from time to time, there would remain, sometimes for twenty years together, a substratum of the most nauseous and disgusting description. And it appears from earlier accounts, and from certain civic restrictions and regulations, that this loathsome mess was at length turned out into the narrow streets, to be consumed by dogs, cats, pigs, and poultry, or imperfectly washed away by the rain. That this is no exaggerated statement we may infer from the improvements made and regulations issued after the Fire. The streets were widened and levelled for the more free flow of the waters, and the sign-boards were ordered to be fixed against the houses ; proper places were selected for lay-stalls ; cess-pools were made at the grates of the sewers to receive sand or gravel and prevent choking ; the " Fellowship of Carmen " were to cleanse the streets from " dung, soil, filth, and dirt," and persons were forbidden to lay in the streets any dead animals, offal, or " noisome thing," or to feed kine, goats, hogs, or poultry, in the streets, or to cast any carrion, putrid flesh, rotten vegetables, rubbish, or dung, into the ditches or sewers, grates, or " gulleys." And lastly, the offensive refuse of the houses was not to be run off into the drains or common sewers. The regulations for street cleansing had been rendered doubly necessary by the destruction of 40,000 dogs and five times as many cats, which had acted the part of scavengers, with the serious drawback of substituting one set of offensive matters for another. The younger Heberden, after describing these improvements, is guilty, I fear, of some exaggeration when he says that " in a few years the new town rose up like a phoenix from the Fire with increased vigour and beauty," producing in the country a spirit of improvement till then

unknown. Allan Cunningham's picture of Sir Christopher Wren, harassed and disappointed, watching "in silence the new city rising up with streets confined and narrow, and house huddled upon house, mean, or plain, or neat, according to the pleasure or purse of the proprietor," is more in conformity with the truth. The phoenix which would have risen from the ashes of the Plague-smitten city, had Sir Christopher been allowed to mould it into shape, would have been a noble assemblage of streets from 90 feet wide down to a minimum of 30, bordered with houses uniform in plan. A spacious street would have stretched from Aldgate to Temple Bar; a second, starting from the Tower, and meeting it at a sharp angle, enclosed St. Paul's Cathedral, with a piazza to the west. At the river's edge, a broad quay extended from London Bridge to the Temple, with all the halls of the City Companies, alternating and contrasting with merchants' warehouses, skirting it throughout its whole length; while piazzas and markets dotted the scene, and the rebuilt city churches, at suitable distances, closed the vistas of houses, and gave height and beauty to the whole. Add to this tantalizing vision of what might have been, an Exchange standing in the middle of a piazza (a sort of Roman forum with double porticoes), with bank, mint, post-office, excise office, and other public buildings grouped near it—a noble centre whence the streets should radiate to the principal parts of the city—and we have the *beau idéal* of a metropolis of a great nation, "the wonder of the world." From this vision of beauty, the wholesome and the useful were not to be shut out. A canal was to be cut 120 feet wide with flushing arrangements at Holborn Bridge, and coal stores on either side; and churchyards, and trades requiring great fires, or yielding noisome smells, were to be placed beyond the limits of the city. This was no

architect's dream, for to use the words of Sir Christopher's son, "the practicability of this whole scheme, without loss to any man, or infringement of any property, was at that time demonstrated, and all material objections fully weighed and answered." Perhaps it was a further recommendation of it that King Charles approved it and presented it to the council. "The ingenious Mr. John Evelyn," too, propounded a plan, with a river-quay, straight wide streets, large open spaces with fountains and conduits, a Royal Exchange well placed on the river, and public buildings judiciously distributed—if I may offer an opinion on such a subject, a good, wholesome, handsome plan, though not equal to that of our great architect. But the citizens did not like either plan or any plan at all. They would not submit to the necessary delay; they had a preference for narrow streets, crooked lanes, and blind courts; thought a crowded city in itself beautiful; and did not want their new capital to "look like a city of lords rather than of merchants." And thus was lost this golden opportunity "of making the new city the most magnificent as well as commodious for health and trade of any upon earth."

London, then, having risen from its ashes with wider streets, less combustible and more spacious houses, and better sanitary arrangements; but with no grand and comprehensive structural improvements, and with its outlying districts unchanged; let us try to find out what effect was produced upon the health of the inhabitants in the remaining third of the seventeenth century.

As the Bills of Mortality, for the two years 1667 and 1668 give the returns of births and deaths only for the 16 parishes left standing, and not for the 97 parishes within the walls till 1669, it is safe to infer that the city began to be inhabited afresh in this year 1669. It further appears from the figures for subsequent years that the

work of re-population must have been a gradual one. The number of births shows a progressive increase for 12 years, and the deaths exhibit the same tendency, with marked fluctuations. Now, during all these years, from 1667 to 1679, when the last entry under the head of the Plague occurs, there are recorded no less than 82 deaths from plague, and not one of these took place within the limits of the re-built city, or of the 16 parishes left standing. If then our examination of the Bills of Mortality were restricted to the years following the Great Fire, we should naturally infer that the reconstructed city was proof against the plague that still continued to attack the inhabitants of the out-lying parishes which the fire had spared. But this inference would be unsound ; for, on examining the Bills for the years 1657 to 1664 preceding the Plague and the Fire, I find that while no less than 113 deaths by plague occurred in the out-parishes, only 2 took place in those within the walls ; and that in the five years 1660 to 1664, the returns for which include the five Westminster parishes, we have one death only within the walls for 60 without the walls.

We are justified, therefore, in inferring that, except in years when Plague was epidemic, the city within the walls was very nearly plague-proof ; and also in disturbing the belief generally entertained that the Great Fire gave the *coup de grace* to the Plague.

This amended view of the subject receives some support from the fact that the proportion of deaths by plague to deaths from all other causes was always, even in epidemic years, lower in the 97 parishes within, than in those without, the city, or those described as out-parishes. Thus, in 1625, while 64 per cent. of the deaths within the city were set down to plague, and 64 also in the parishes without the walls, 70 per cent. was the ratio for the out-parishes. Again, in 1636, while the ratio of deaths from

plague was only 30 per cent. within, it was 40 per cent. without, the walls, and 70 per cent. in the out-parishes. And again, in 1665, the deaths by plague within the walls having been 65 per cent. of the total deaths, they were 70 per cent. in both groups of out-lying parishes.

Doubtless the city within the walls was always a superior place of residence. Its Cathedral, its Exchange, and its city companies claimed space for themselves, and its wealthy citizens lived in better houses and wider streets than the people in the out-lying parishes. It was in such labyrinths of narrow and squalid streets, as some of us remember in the "rookery" of St. Giles, before New Oxford Street was run through it, that the poverty and crime of London took up their abode; and in such districts the plague was rife in epidemic years, and lingered in the years when the parishes within the walls were free. So that it is not true that the Fire of London, so often spoken of as a blessing in disguise, brought about a state of things which guaranteed us against future epidemics of the Plague; for it left standing not only 16 parishes within, and 14 out of 16 without, the walls, but all the out-lying parishes in which the Plague had always proved most fatal and lingered longest. The peculiar hunting grounds of the pestilence remained intact, and probably underwent little change during the last years of the seventeenth century. They were far from plague-proof; and we must look elsewhere than to the Fire, which did not touch them, for the causes of the immunity from the Plague which, as we know, many cities of the continent did not enjoy. If the Great Fire did give us wider streets, better houses and improved municipal arrangements, it was at the cost of the destruction of many noble buildings we could ill spare, and of more than one library we could not replace. "This blessing in disguise," like the "phœnix"

which Heberden imagined, must, I fear, be added to the delusions which a pious fancy has framed but a just criticism dispels.

What the Fire and the Plague did was to disturb and dislocate the population of London, thus placing a serious obstacle in the way of all comparisons of the numbers and causes of death in the years following. And the same obstacle, though in a minor degree, was created by the plague epidemics of 1603, 1625, and 1636. If, in addition to this disturbing cause, we take into account the unsatisfactory way in which the returns of the causes of death were made, the exclusion of deaths of Jews and Quakers, the changes in the nomenclature, the difficulty of ascertaining the meaning of terms, the acknowledged defects in the returns of births, the additions so often made of new parishes to those comprised in the returns, and, above all, the want of trustworthy censuses of population, we shall see the necessity of proceeding with great caution in any attempt to ascertain the sanitary condition of the inhabitants of London at different periods of the seventeenth century. The only data which may, I think, be used without much fear of misleading us, are the proportions which certain well defined and easily ascertained causes of death bear to the whole number of deaths, with the proviso that, in making choice of years, or groups of years, to be compared with each other, we avoid those in which the Plague was epidemic, and those also in which changes were made in the parishes comprised in the bills.

Observing these precautions, I am able to select for comparison three periods of five years each, those ending 1635, those ending 1664, and those ending 1693. It happens that these dates are separated by intervals of 29 years. Now I begin by arranging the causes of death in four groups:—1. Deaths in infancy and childhood; 2. Deaths in old age, and from diseases incident to the

aged; 3. Deaths by zymotic maladies, and 4. deaths by consumption: and I find that the ratio of deaths in infancy and childhood to deaths from all causes was 37 per cent. in the five years ending 1635; 25 per cent. in those ending 1664; and 32 per cent. in those ending 1693. Taking next the deaths in old age, I find that they were for the three periods respectively 8, 8, and 7 per cent. Next come the group of zymotic diseases; and I find that these gave rise to 23 per cent. of the deaths in the first five years, 28 per cent. in the second, and 32 per cent. in the third; and lastly, consumption proved fatal to life in the ratios of 20, 21, and 17 per cent. You see then that the mortality of infants and children, which fell considerably towards the middle of the century, rose again, though not to the high level of the early years; that the number who reached old age was less at the end than at the beginning and middle of the century; that the deaths from zymotic maladies progressively increased throughout the whole period under review; and that this increase coincided with a marked fall in the deaths from consumption towards the end of the century.

Let us now see what additional light is thrown on the sanitary state of the last part of the seventeenth century by the figures taken somewhat in detail.

First, let us take the group of fevers—ague and fever, spotted fever, and plague. Well! these gave rise to 14 per cent. in the five years ending 1635, and 16 per cent. in those ending 1664, and 1693 respectively: that is to say, 14, 16, and 16 per cent. of all causes of death put together.

Let us take next in order small-pox and measles. The ratios for these two diseases are 5, 5, and $5\frac{1}{2}$ per cent. for the three periods.

Next let us take the several entries which comprise the deaths from dysentery, diarrhœa, and cholera. These

increased in the remarkable ratios of 4, $7\frac{1}{2}$, and 16 per cent.

The entries under scurvy and sores and ulcers, which we shall by-and-by find to be closely associated with dysentery in unwholesome ships, destroyed life in the ratios of 3, 8, and 5 per thousand.

Syphilis increased at the rate of 1, 3, and 4 per thousand.

King's evil remained stationary at 3 per thousand; while this and other diseases implying slow deaths in childhood, taken together, account for 1 per cent. of the deaths in the first period, 3 in the second, and 2 in the third.

In these numerical statements, I take no account of the estimated population at the three periods referred to; but only of the proportion of deaths from special causes to total deaths; and partly for this reason, that the limits of the Bills of Mortality were extended by successive additions, seven parishes having been added between 1636 and 1664, and four between 1664 and 1693.

I will finish what I have to say on the sanitary state of London in the last 30 years or so of the seventeenth century by stating my impression that there was an increased mortality from fevers, from small-pox and measles, from dysentery and bowel complaints, and from syphilis; that scrofula remained stationary; that the diseases of children, at their worst about the middle of the century, improved towards the end of it; that the same is true of scorbutic maladies; but that, on the whole, the health of London experienced no change for the better during the seventeenth century, except in the relief obtained from the incursions of the Plague.

This inference from the Bills of Mortality is confirmed by a perusal of Sydenham's "*Medical Observations concerning the History and Cure of Acute Diseases*," sup-

plemented by his "Epistles," which works contain an account of the epidemic diseases of London, extending over the 25 years from 1661 to 1685.

I will briefly state what I glean from these works. In the first place, I learn that autumnal intermittents, severe and very fatal, which had been on the increase for some years previous to 1661, broke out about the beginning of July of that year, and by August "were doing fearful mischief," causing excessive mortality, and carrying off whole families, and that these agues continued to prevail till 1665, the year of the Plague. After that they became of "exceeding rarity" till the year 1678. This statement agrees well with the entries in the London Bills, which indicate 1661 to 1665, and also 1685-86, as well marked epidemic years for ague and fever.

Continued fever prevailed in many different forms; at one time (as from 1661 to 1665) a *miniature* of the intermittent; at another (as in 1667) a sort of small-pox without a rash; at another (as in 1669) a kind of dysenteric fever; at another (as in 1685) complicated with cough: always, as Sydenham thought, modelled somewhat after the fashion of the prevailing epidemic, whatever that might be, whether ague, small-pox, or dysentery. In 1685-86 this continued fever, complicated with cough, was epidemic not in London only, but in all England. There was a like epidemic in 1679; and if we retrace our steps to the great plague year 1665, we find the long, cold, dry winter very productive of bronchitis, pleurisy, and quinsey.

Small-pox, in some years "favourable and of regular type," in others "anomalous," "black," "irregular," was epidemic about once in three years, and measles, of extreme severity in 1674, and less fatal in 1664 and 1670,

about once in two years. Measles more than once proved the epidemic forerunner of the small-pox.

Dysentery, very severe and fatal in 1669, was seen in form of epidemic every three or four years; and the *cholera morbus* of Sydenham (the English cholera of our own day in an aggravated form) sometimes, as in 1669, associated with colic and dysentery, paid our London ancestors a visit of five or six weeks in the months of August and September of more than one of the years under review. The disease we now call bronchitis, with pleurisy and quinsey, were epidemic in the seventeenth century as they are now, whenever a long, cold, dry winter occurred to test the vital powers of the aged, the weak, and the intemperate: 1665 and 1683 were such winters, and had such consequences. It was in 1683 that, as Sydenham states, "the cold was more severe than it had ever been within the memory of man. So cold was it that the noble river Thames was frozen up, so that carriages could pass upon it, and shops be opened, and business done just as in a street," the people "walking on the solid ice as on a pavement." The next year was not "much below it," but the cold did not last so long. There is one disease described by Sydenham which I have not yet noticed; the *lues venerea*. I find it credited in the Bills with a number of deaths increasing towards the end of the century. In 1675 it caused 97 deaths, in 1680, 114; in 1694, 104. What a terrible scourge it was may be inferred from Sydenham's description of it. After enumerating its ravages among the several textures and organs of the body—ravages which we, in these days, witness rarely in the worst cases—he describes the unhappy patient as wasting away in "continual torture," dragging on an existence which "pain, fœtor, caries, and shame," make worse than any death, till "at length,

limb by limb perishing away, the lacerated body, a burden to earth, finds ease only in the grave." Sydenham has no difficulty in fixing on 1493 as the date of the introduction of this scourge into Europe, and on the coast of Guinea as its birth-place. If so, it may be added to the long list of injuries which the slave trade inflicted upon us.

This brief reference to the works of our great physician has certainly confirmed the teachings of the Bills of Mortality; and assuredly the words with which he concludes his chapter on the Quinsey do not exaggerate the work the physicians of the last half of the seventeenth century had to do. "A murderous array of diseases" had "to be fought against, and the battle" was "not a battle for the sluggard. Day by day there" was "a combat against the life of man, and there" "was neither truce nor quarter. Many" died "by violent deaths; but, with the exception of these, two-thirds of our race" died "of fevers," making "continuous attacks," and winning "daily victories over strong men in the flower of their age."

And yet these destructive epidemics, some of which, like plague, are wholly, and some, like ague, nearly extinct, as causes of death; and others, as syphilis, have lost much of their malignity; prevailed in a century by no means wanting in great physiological and medical discoveries, or destitute of new and valuable sanitary appliances. Early in the second quarter (1628) Harvey made his grand discovery, or rather complete demonstration, of the circulation of the blood. The lacteals had been discovered six years before; and, as early as 1617, John Woodall, surgeon to St. Bartholomew's, and inventor of the Trepphine, in his "Surgeon's Mate, or Military and Domestic Medicine," recommended lemon-juice in scurvy, not daring to give it its due praise as a sauce to meat, "lest the chief in the ship should waste it in the great cabin to save vinegar."

The middle of the century witnessed the introduction and sale in London of more than one article of diet, and of one medicine, that must have had some effect on the health of the people. Coffee, chocolate, and tea, were first sold as drinks between the years 1655 and 1657, and the Peruvian Bark, a specific for the ague, was sold in 1658, having been introduced in 1655, and firmly established as a medicine of repute by 1663. Sydenham made free use of it in a regular way, and one Talbor as a secret remedy. Need I remind you that tobacco was in common use throughout the whole of the seventeenth century? that it had the honour of being attacked by James I., and legally persecuted in 1604? that despotic emperors, infallible popes, and intolerant Swiss republics, brought all their artillery of punishment to bear on those who used it as snuff, or smoked it; and that the irrepressible weed, "loathsome to the eye, hatefull to the nose, harmefull to the brain, dangerous to the lungs," still sends up its "blackest stinking fume"—"its horrible Stygian smoake"—in burning deserts, and wintry solitudes, the seaman's luxury, the prisoner's temptation, the pet weakness of civilized, and the prime enjoyment of savage, men.

So that, in the "daily combat against the life of man," Sydenham was armed with Cinchona Bark, in addition to the old and well tried remedies—mercury, antimony, opium, and the lancet, all of which he used freely, but with discretion. But he armed himself also with something better than these, and especially important in its bearing on the diseases which were the chief objects of his study. He revived, and stamped with the weight of his great authority, the use of that "cool regimen," of which the value is said to have been first recognised and proved by John Crane, who practised in Cambridge, and died there in 1552. If we must affix a date to Sydenham's revival of this method, 1682 will be the year.

But what with want of appreciation (the case of lemon-juice) ; or scarcity, dearness, and adulteration, backed by apparent failure, or worse, in some conspicuous case (as happened with the bark) ; or obstinate prejudice (such as the cool regimen had to contend with) ; or the chronic resistance of old habits (as in the contest of coffee, chocolate, and tea, with beer, spirits, and wine) : the practical effect of these drinks and medicines, like the reforms in medical treatment, and the improvements in the houses, clothing, dietaries, and habits of the people, was not considerable ; and we arrive at the end of the seventeenth century with anything but a clean bill of health.

And now I must devote what remains of this Lecture to the prevalent and fatal diseases of the eighteenth century, using for this purpose chiefly the facts relating to the metropolis, and dividing the century, as I said I should do, into two equal halves. I might, indeed, have adopted with great propriety an unequal division at the year 1774, inasmuch as up to that date the history of the century is marked rather by steady progress towards a better state of things than by any grand sanitary event ; while the year 1774, as you must have inferred from what I said in my first Lecture, is a date never to be forgotten by Englishmen so long as they hold in esteem the greatest virtues displayed in the purchase of the greatest blessings. But if I had adopted this division I must have separated the great sanitary reforms of Sir George Baker and Captain Cook from the still greater ones which we owe to John Howard and Edward Jenner. By dividing the century into two equal halves, I shall be able to bring together, as the work of the last years of the second half, the sanitary labours and reforms of these four men.

I shall begin my inquiry into the sanitary state of the eighteenth century by comparing the ratios borne by the four leading groups and causes of death—infants and children ;

aged, zymotic diseases, and consumption—with deaths from all causes, for each of the years 1700, 1725, 1750, 1775, and 1800; and to give more value to these figures, I shall compare them with the years 1650 and 1850.

I take first in order the deaths of infants and young children, and I find the ratios to be as follows:—1700, 36; 1725, 37; 1750, 33; 1775, 34; 1800, 26.

The deaths in old age, and from the chief diseases incident to age, run thus:—1700, 7; 1725, 9; 1750, also 9; 1775, 8; 1800, 9.

Zymotic diseases, which I take next, occasioned the following proportionate numbers of deaths:—1700, 30; 1725, 29; 1750, 25; 1775, also 25; 1800, 21.

And lastly, consumption contributed the quota of deaths shown in these figures:—1700, 15; 1725, also 15; 1750, 21; 1775, 26; 1800, 29.

If I read these figures aright, they justify these inferences:—That the deaths of infants and young children were less numerous in proportion at the end of the century than at the beginning; and those in old age somewhat more numerous; that the deaths by zymotic maladies fell continuously from 30 to 21; while those attributed to consumption increased, also continuously, from 15 to 29. If we compare the first with the last year of the century, we find a decrease in the mortality of infants and children of more than one fourth; an increase in that of old persons of less than one-third; a decrease in that by zymotic maladies of one-third; an increase in the deaths by consumption of nearly 50 per cent.

Let us now take the figures for the years 1650, 1750, and 1850, and see what they teach us. For infants and young children, they are 32, 33, and 13 per cent.; for aged persons, 9, 9, and 13; for zymotic maladies, 18, 25, and 21; and for consumption, 23, 21, and 14. I infer from these figures that the middle of the eighteenth cen-

ture was, on the whole, less favourable to life, and more infested by zymotic maladies than the middle of the seventeenth, and that the middle of the nineteenth century showed a marked improvement over both its predecessors, except in the item of zymotic maladies, in which the middle of the seventeenth century contrasts very favourably with it.

These figures, which relate to single years, are, of course, somewhat modified if we substitute periods of five years each. I have made calculations on this basis, and find that the results are in harmony with those for single years; but they give us a less favourable impression of the first 25 years of the century, and even of the last 25, while the numbers for the second and third quarters justify the view that those were periods of progressive sanitary improvement. At any rate, the figures for the years ending 1725 stimulate the curiosity to look somewhat closely at the facts at our disposal relating to this, the first quarter of the century.

Beginning with the Bills of Mortality, and passing the more fatal maladies in review, I find that there are abrupt transitions in the figures which I do not find in our own times. Thus, to take but one example, there were 12 deaths from measles in 1704, 319 the year following, and 361 the year after that. Other figures, which I have before me, display frequent fluctuations eminently characteristic of epidemic maladies. Of the 25 years, 11 are remarkable for excess of mortality, and for the number of diseases that contribute to it.

The inference drawn from the London Bills is amply confirmed by the facts contained in Dr. Thomas Short's careful and learned compilation, in which the weather and diseases in England and on the Continent are recorded year by year. The most notable fact bearing indirectly on our own sanitary history is the prevalence of the Plague among the northern nations of the Continent, from 1702

to 1716; and it is worthy of remark that a "malignant fever," "very mortal," raged "in Harwich, &c.," in 1709, "from the communication with foreign parts." In 1710, again, we read of "a catarrhus fever, called the Dunkirk rant, or Dunkirk ague," "brought by disbanded soldiers into England;" also of the small-pox and spotted fever, very fatal in Norwich. The two years, 1714 and 1723, are noticed as peculiarly fatal throughout England. This last year (1723), as well as 1710, the influenza was epidemic; and in 1724 the colic was so general in Devonshire, as to be called an epidemic.

Time will not allow me to dwell on the severe winters, storms, droughts, scarcities, atmospheric disturbances, and epizootics of this period. But I may remark that the yearly details remind one of the earlier times when our worst pestilences prevailed.

Of sanitary inventions and improvements belonging to this first quarter of the eighteenth century, I have also little to say. The most interesting procedure of the kind was the practice of inoculation, introduced into England in 1722, of which the history belongs to the last Lecture of this course. Another sanitary procedure belonging to this first half of the century relates to ventilation, of which more presently.

In treating of the prevalent and fatal diseases of the second quarter of the century, I am still able to avail myself of the London Bills, and of the valuable compilation of Dr. Short. I find that the annual fluctuations in the deaths are still very large. I will give a few examples:—Ague, which occasioned 11 deaths in 1727, caused 44 in 1728; fevers which destroyed 4003 in 1740, killed 7528 the year following; small-pox, set down for 1206 deaths in 1745, figures for 3236 in 1746; and measles, which destroyed 30 in 1732, proved fatal to no less than 605 in 1733. Quinsey shows a fluctuation from 10 to 31, ery-

sipelas from 1 to 5, dysentery from 2 to 15, and English cholera from 22 to 103 in successive years. The largest increase in the aggregate mortality occurred in 1733. The previous year the deaths exceeded 23,000: that year they were upwards of 29,000. The years marked by a high mortality were, as in the first quarter, 11 in number, or little less than one-half.

I now turn to Dr. Short's pages again, to see how far his statements, based, as they are, partly on his own experience, partly on the facts carefully recorded by Winttingham, Huxham, Hillary, and others, bear out these inferences from the London Bills.

From the two together we learn that while the last two years of the first quarter of the century were healthy, the second quarter began with a decided increase of mortality, small-pox being the only one of its class that did not prove unusually fatal. The next was a year of scarcity. Dysentery prevailed, fever continued common, and small-pox took the place of measles. Passing over the more healthy year, 1728, we come to 1729, a year marked by a high mortality from all the epidemics, except measles, and in September by an attack of influenza. The season was unusually "moist, rainy, cloudy, and foggy," and "of a sudden," there "broke out and raged all over Europe, and perhaps the globe, a most universal epidemic catarrh." "In London near 1000 died weekly during September." Of the frightful mortality of the small-pox this year we may form some idea from the fact that at Ipswich 13 out of 19 died. 1729, then, was doubtless a very fatal year; and Short says of it, and of some years preceding, "that the insalubrity of the air was universal." The years 1730 and 1731 were healthy years; but the winter of 1732-3 witnessed another outbreak of influenza, which Dr. Short characterizes as "the most sudden and universally epidemic catarrh that has been in this age, sparing neither ranks,

sexes, ages ;” “ old or young, weak or strong ;” and killing off “ many hectic and phthisical people.”

It was a particular attention to this epidemic, and its consequences, that first set Short upon that “ quest of epidemics in all ages ;” which, as he says, gave him a better acquaintance with physic than all “ his former studies ; and convinced” him, not only of “ the uselessness, but perniciousness, of theories and hypotheses in practice.”

That part of the epidemic influenza of 1732-3 which belonged to 1732 did not tell upon the mortality so as to prevent it from being what Huxham calls it, “ the most favourable and kindly season for health that had been above sixty years before.” But things were so changed in the early part of 1733, that the deaths which in the first week in February (in London) were 1156, increased to a maximum of 1588, of which “ never happened the like before, since the great Plague.” There were two other outbreaks of influenza in this second quarter of the century ; one, described by Huxham, in 1737, and another, also described by him, in 1743. So that we have in this space of twenty-five years, four well-marked epidemics of influenza ; in the years 1729, 1733, 1737, and 1743.

Between 1733 and 1736 two comparatively healthy years were interposed ; and then we come upon two years of higher mortality, in which measles, and small-pox, and quinseys are rife, with much mortality among cattle. Measles were especially fatal. In 1737 influenza prevailed. Then, we have two comparatively healthy years, followed by a year of scarcity (1740) caused by a long, severe winter leading up to a late summer, “ a most memorable year in future histories.” In 1741, “ a malignant spotted fever raged among the poor, who had been half-starved the last two years,”—a fever much the same as that which raged in Bristol the year before and in Galway this same year, but modified since its importation

by two men of war from Gibraltar into Plymouth in 1740—a fever so bad that it would probably have been “a true plague, had the constitution of the air favoured it”—“the most general, frightful, and fatal” that Dr. Short “had ever seen.”

From 1742 to 1745, the death-rate in London was, on the whole, favourable; but there was an exception in the case of children; for, in the year 1742, there was a renewal of that “putrid sore throat,” that *morbus strangu-latorius*, which had been seen in Spain in 1610, and first recognised in England in 1739, and with which the name of Fothergill is so honourably associated. It seems to have been common in London and near it in 1746, and attained its acme in 1747-48. It was the scarlet fever of our own day, in its very worst form, eminently contagious, and so fatal that it “carried off whole families of children, and seized some of their attendants,” and “in one small market-town” 80 out of 90, treated by bleeding, died. The years 1746 and 1747, but especially the first of these, were years of high mortality. Small-pox, spotted fever, dysentery, and measles all prevailed, and the death-rate was very high.

The last three years of the second quarter of the century, were healthy, but measles were very fatal in the first, and dysentery in the last of the triad.

The sanitary reforms and improvements most deserving of attention in this first half of the century are: 1. The progress of Inoculation; 2. The successful attempts made to ventilate our ships and buildings, and 3. The eminently disastrous, and, because disastrous, instructive expedition of Anson in 1740. Of these the subject of Ventilation alone requires to be noticed in this place. The practice of Inoculation will be examined in my eighth Lecture, and Anson's voyage in my next.

The early history of ventilation is extremely interesting.

It may be said to date from a time when the legislature first felt the want of air in the House of Commons, and called the great architect Sir Christopher Wren to remedy the defect. This he did by making a square hole in the ceiling of the House at each corner, which hole formed the base of a truncated pyramid rising six or eight feet into the room above. Sir Christopher, of course, expected that the air from the House would always rise through these short chimneys, forgetting that air in chimneys is greatly assisted in its upward movement by the fire, and has an awkward habit of passing the other way when there is no fire burning. This was found to happen whenever the air in the room above was colder than that of the house itself. Those members who happened to be near the corners found themselves in the same shower-bath of cold air that I once felt when sitting in the old reading-room of the British Museum under a hole in the ceiling covered by an ornamental *patera*. At what time Sir Christopher was employed to do this work, I do not know ; but it was in 1723 that Desaguliers was asked to remedy the inconvenience. This he did very effectually by closing the four pyramids at the top, and carrying tubes from openings in their sides to fire-places in two closets, so that the air of the House should feed the fires and pass away through the chimneys. The fires were to be lighted before the members met, and when this was done the plan answered completely, and the House was kept very cool. But Desaguliers and his plan had an unexpected difficulty to encounter. Mrs. Smith, the housekeeper, was disturbed in the possession of her rooms, and with skill equal to his own, baffled his designs, and daily stifled the House without incurring its displeasure. Her plan of operation was simple and effectual. Instead of lighting the fires before the House met, she waited till the House was heated. Sir George Beaumont and

others "observing that the design of cooling the House was frustrated," but not, I presume, suspecting the wicked housekeeper, applied to the doctor for some contrivance for extracting the hot air which should be under his own control. This was in 1736. The doctor again proved himself equal to the occasion by inventing "a centrifugal or blowing wheel," which was "able to suck out the foul air or throw in fresh, or to do both at once," as the Speaker might be pleased to command.

But, important as it was to promote the comfort and health of the nation's representatives, there was a class of men who stood much more in need of assistance, and were, in their way, quite as valuable to the nation—I mean our soldiers and sailors. About this time an expedition was being organized against the Spaniards. The troops had been embarked at Spithead, but numbers of them were obliged to be relanded and sent to hospital; for the ships "stunk to such a degree that they infected one another." The Lords of the Admiralty accordingly applied to Desaguliers, saw his models at work, and, in company with Sir Jacob Ackworth, the surveyor of the Navy, inspected the wheel fixed over the House of Commons. The authorities were satisfied, and ordered a smaller wheel to be tried on board the *Kinsale*, at Woolwich. This was done; but Sir Jacob contrived to bring the machine into disrepute by a rough and off-hand comparison with the old wind-sail, and dismissed the whole affair, expressing regret at the failure of the doctor's wheel, and saying that "he thought it might be a very *pretty* thing in a house."

Sir Jacob was then dealing with a philosopher, and easily contrived to give what was called the "shuffling kick" to the machine and its contriver. But he was soon to encounter a sturdier antagonist in a worthy brewer, Mr. Samuel Sutton, who, touched with compas-

sion for the poor sufferers at Spithead, determined to try "what could be done by fire." He accordingly made a preliminary experiment in a room with three fire-places, and found that, on kindling large fires in two of them, the air that came down the third chimney was able to put out a candle, and that when all the fires were lighted, the air entered the room with such force, "as to raise a pulley with half a hundred weight." This use of fire to produce a draft was the essence of Desaguliers' first plan for ventilating the House of Commons; but Sutton probably did not know this. Be this as it may, he gave himself very earnestly to the work of ventilating ships on this principle. He made use of the fire or fires already existing on board the ship, and led a pipe from the ship's well, or from any other part of the vessel where change of air was needed, to the ash-pit, and so caused the foul air to blow the fire, and pass away up the chimney. What steps the sturdy brewer took to commend his cheap and simple invention; how some practical sailors pitied him, as being mad; how Sir Charles Wager gave him a letter of introduction to the redoubtable Sir Jacob; how he told him "that no experiment should be made if he could hinder it;" how he petitioned the Lords of the Admiralty; how they gave orders that were set at nought; how he commended himself to Dr. Mead, and Martin Folkes, President of the Royal Society; how these gentlemen waited on the Lords of the Admiralty, who again ordered the plan to be tried; how it was tried in presence of Mead and Folkes, and several other members, and Sir Jacob Ackworth, who was sorry to see them come "to the trial of such a foolish experiment;" how the experiment answered to the satisfaction of all present; how Sir Charles Wager gave a peremptory order which was at last carried out on board the *Norwich* man-of-war; how Sutton received from the

Admiralty the magnificent reward of 100*l.*; and how, after troubles, trials, and disappointments innumerable, he had, at last, the satisfaction of seeing his pipes fixed on board all his Majesty's ships, I have not time to tell you. Nor can I stop to describe Dr. Hales' invention of a species of bellows, his "ship's lungs," which had the disadvantage, in common with Desaguliers' wheel, of not being self-acting. This history must finish for the present with a brief statement that, in spite of the proved efficacy of Sutton's simple and cheap plan, and its power of saving lives so valuable, he was employed only for a brief space in fixing his apparatus in king's ships and Indiamen, and that in a year or two no other method of ventilation was known on board ship but the "old way of wind-sails," which egregiously failed when most wanted, namely in calms and in rough weather. How useless the wind-sail ventilator was in bad weather, Anson's little fleet lying at Spithead when the experiments of Hales and Sutton were in progress, and which left England without any other provision for ventilation, was destined soon to discover by a most bitter experience.

Sutton successfully applied his plan to buildings, and wished to extend it to Newgate; but though he expected to find an unanswerable argument in his favour in the outbreak of jail fever that took place in the last year of the half century (1750), he was disappointed, and the prison was allowed to remain as before.

I have introduced this subject of ventilation, as belonging to the history of sanitary science in the second quarter, or first half, of the century, and as a contributory to the improved health of which there are indications. It is true that Desaguliers, Sutton, and Hales were all doomed to disappointment, and that their plans fell into disuse; but publicity was secured, and ventilators and schemes of ventilation came into fashion; so that, when

the managers of public establishments found their buildings offensive, and deemed them dangerous, there was always some ingenious person to assist them in the work of improvement. Hence it happened that, in 1784, St. Thomas's Hospital was ventilated by a Mr. Whitehurst, of Derby; that the year following a contrivance, borrowed from a French frigate, began to be used in English vessels of war; and that here and there ventilation was brought to bear on the jail fever.

In what remains of this Lecture, I must treat briefly of the sanitary state of the last half of the eighteenth century, dividing it for convenience into quarters. And here, as I lose Dr. Short's guidance, and Dr. Fothergill's annual reports of the seasons and sickness only extend to a few years of the third quarter, I will limit myself chiefly to what I can glean from the Bills of Mortality.

Beginning with the third quarter, I must remind you that the figures already adduced indicate a marked improvement over the quarter preceding in zymotic, or epidemic maladies. They fell in the ratio of 26 to 20, the mortality of children being stationary, while that of aged persons fell in the ratio of 9 to 8, and deaths from consumption maintained their progressive increase. On the whole, too, the figures show less violent fluctuations from year to year, with the exception of diarrhœa, small-pox, and measles, and which continue very fatal and very fluctuating. Thus small-pox, which killed 38 persons in 1766, destroyed 1196 the year following, and 1987 the year after that; and measles credited with 795 deaths in 1774, caused 15 the year previous, and only 1 death the year following.

The influenza prevailed as an epidemic four times in this third quarter:—in 1758, 1762, 1767, and 1775: and it occurred, as you recollect, four times in the second quarter.

The last quarter of the century, which displays a marked decrease in the mortality of children, and some increase in that of aged persons, shows a reaction, to the amount of one-tenth, in zymotic maladies, and a great increase in deaths from consumption; and we do not find any case of such extreme annual fluctuation in small-pox and measles as occurred in the previous quarter. The greatest fluctuation in small-pox occurs in the years 1770-72. The deaths were 871 in the first year, 3500 in the second, and 636 in the third. Measles shows its greatest fluctuation in 1785-86. In the first year it caused 20 deaths, in the second 793. Next year the deaths fell to 84. Dysentery and diarrhœa show a remarkable increase in 1780 and 1781; the entry of "ague" and "ague and fever" give place during the last ten years of the century to the simple entry "fever," and influenza seems to have attracted attention once only in this quarter, in 1782. Of the quarter generally it may be said that it shows some improvement over its predecessor. But the year 1800 was marked by an increase in infantile mortality, in small-pox and measles, and in the death-rate from all causes.

To what I have said of the prevalent and fatal diseases of the eighteenth century, I will only add that the London Bills for the first quarter of the nineteenth exhibit at a glance a very material improvement in the public health. The figures in the column headed "fever" show a marked falling off; small-pox is evidently on the decrease, and the total mortality exhibits both diminished intensity and greater freedom from fluctuation. The great sanitary reforms of the last half of the century had evidently left their mark on the death-registers of the early part of the nineteenth century.

They are almost summed up in the words, lead colic, scurvy, jail-fever, small-pox: in the honoured names of Baker, Cook, Howard, and Jenner.

LECTURE VI.

THE SCURVY.

I AM now to treat of lead colic and scurvy ; of the first, briefly, of the second more at large. Briefly of the first, because I have already, in my first Lecture, spoken of Sir George Baker's discovery of lead impregnation as the true cause of the colic that seized the drinkers of Devonshire cyder. I now revert to the subject as belonging to the sanitary reforms of the eighteenth century, and of the third quarter of it. The date of the discovery is 1767. It is, therefore, the first of that remarkable series of sanitary improvements and reforms which ended with the triumph of vaccination in 1796.

In my first Lecture I proved by figures the wide prevalence of lead poisoning in Devonshire. I will now adduce further proofs of the same sort from the treatise of Huxham, who practised at Plymouth, and is in every way a good authority. He tells us that, early in the autumn of 1724, "a disorder exceedingly epidemical spread itself over all the county of Devon, among the populace especially." It lasted till the following spring. It was so "vastly common" that there was "scarce a family amongst the lower rank of people that had it not," and he often saw five or six lying ill of it in the same house. Such an epidemic colic was never seen before, unless it were that described by Paulus Ægineta as attacking many parts of Italy and the Roman empire, and which was undoubtedly the lead colic, attended by palsy and epilepsy, as

was this of Devonshire. Huxham traced it to an incredible quantity of apples. No such apple-year had occurred within the memory of man, and the quantity of cyder was in proportion. Huxham recognised the coincidence of much colic and many apples; but he (and Musgrave before him) missed the true cause which Sir George Baker so happily discovered. This same coincidence had struck Huxham in the years 1722, 1728, 1730, and 1735; but in none of these was the disease so prevalent, or the apple-harvest so abundant. Under the year 1735, and the month of January, Short has this brief entry: "A colic with severe rheumatic pains, and sometimes with a palsy of the arms and hands." Sydenham, too, speaking of the Colica Pictonum, says, "this is a sort of colic, which is wont to degenerate into palsy," and "is extremely common in the West Indies, where it destroys many persons."

To what extent this lead-colic prevailed in other parts of England to which the cyder was sent, we do not know; but it was certainly largely consumed by "scorbutical sailors," of whom Huxham saw a great many cured by apples and cyder alone, and knew the cyder to prove very salutary to sailors voyaging to the East or West Indies. In his short essay on "A Method for preserving the Health of Seamen in long Cruises and Voyages," he prescribed at least a pint a day of "sound, generous cyder" for every sailor. This advice from so eminent a physician, practising in a great seaport in Devonshire, must, I fear, have often caused the colic while it cured the scurvy.

I have said enough to show that Sir George Baker would have rendered excellent service if his discovery had benefited only the people of his own county, and the sailors resorting to its ports. But when we reflect how often lead found its way, intentionally or by accident, into other liquids in common use—into drinking water, wine, and spirits—and in how many other ways it gains access

to the system, we can scarcely appreciate too highly the services of the scientific physician, who, while riveting the attention for a time on one notable form of lead poisoning, warns us of the danger we incur from it in so many other ways. It is a great feat to have detected and disarmed so subtle a foe to health and life—the cause of pain, palsy, epilepsy, and coma.

I may here mention the fact that, in 1755, a few years before Baker wrote about the lead colic, an anonymous writer called the attention of the public to the danger arising from the extensive use then made of copper and brass vessels in washing, brewing, cooking, and preserving, as well as the bad custom of “the good housewife,” who would use copper to colour her pickles.

Before I proceed to speak of the scurvy, let me remind you of the peculiar character and exigencies of the eighteenth century, of the prevalent and fatal diseases of which I am treating. It was, emphatically, a century of war-like struggles by land and sea, of national aggrandizement, of wonderful energy and activity directed outwards. We had, it is true, rebellions in England, Scotland, and Ireland; but our great work lay beyond our own limits. We had to fight with France, Spain, Holland, and America; and to establish and maintain an empire in India; and as the seventeenth century left us a legacy of war, the nineteenth saw us in the midst of one of the greatest struggles that history records. Taking the whole century into account, war was the rule, peace the rare and short exception. Battles and sieges, captured countries and islands, strong military positions taken and held, hostile fleets encountered and defeated, disasters suffered and retrieved, crowd the canvas. We lost our great American colony, and won an Indian empire. For these gigantic struggles two things at least were needed—money and men. Money we might get in part by borrowing, and of that resource we largely availed

ourselves ; but men must be forthcoming as they were needed, and they must be mainly the growth of our own soil. Now our English population, at the beginning of the century, little exceeded six million souls, and a liberal estimate for Scotland and Ireland would raise it to nine ; and out of this nine million, and its increase from year to year, the men necessary to supply the cruel waste of war by land and sea had to be taken. And yet, at the end of the century, we were richer in men than at the beginning of it. The six millions had grown to nine, and the inexorable demands of war had been supplied. If I am asked how this came to pass, I answer in three ways—by the simple growth of population, by savings effected in the lives of infants and young children, and by like savings among our adult population, but especially soldiers and sailors. Of the second I spoke in my last Lecture ; of the third I shall have much to say in what remains of the course : of scurvy and the jail-distemper, in reference to the wars of the eighteenth century, and of small-pox as bearing on the early struggles of the nineteenth.

Of the many maladies known to medical men, *scurvy* is the one respecting which our knowledge is most complete and satisfactory. We recognise it with ease ; we understand its nature, we are in no doubt as to its cause ; we have full knowledge of the diseases with which it associates ; we know by what atmospheric and other conditions it may be promoted, and we have learnt both how to prevent it and how to cure it. We recognise it by the mulberry coloured spots, or blotches, on the extremities, on the trunk, on any and every part of the surface of the body ; by the dark, swollen, and spongy gums ; by the bleeding condition of the whole frame ; not of one part, but of all. Its *nature*, or essential character, then, is the escape of blood from the vessels which in health hold and contain it. Its *associate diseases* are foul ulcers, dysenteries,

and fevers. The *conditions which promote it* are cold and damp, insufficient clothing, foul air, tainted water, over fatigue and exposure, mental listlessness and depression. Its true *cause* is a diet from which vegetables and fruits have been excluded. Its *prevention* and its *cure* alike consist in their supply or restoration. All this was known long ago; and I have already stated that, as early as 1617, Woodall extolled the virtues of lemon-juice. But in recent times we have been able to give to our knowledge both of cause and cure greater precision. We have had experience of paupers and prisoners whose dietary contained but one vegetable element—the potato—who became scorbutic when that was struck off, and regained their health when it was restored. And I state it as the uniform result of my own experience and study of prison returns, that whenever the potato has been withdrawn by the authorities or refused by the individual, scurvy has been the result. This important fact, then, may be added in when we sum up the benefits conferred upon us by the culture of the potato. Dr. Paris enumerates among its products “cottony flax,” sugar, vinegar or spirit, a substitute for soap in bleaching, a most wholesome, nutritious, and economical vegetable, a starch no way inferior to Indian arrow-root; and a valuable anodyne extract. To this catalogue I may add the well-known fact that potato-flour is deemed a necessary constituent of all fermented bread. But Dr. Paris saw in the potato a great political agent. He thought that it raised the population of Ireland from one million to seven millions in a century and a half. The potato famine had not then occurred to teach us that even such a boon as the potato was, and is, cannot be divested of a possible penalty. If Paris was right in ascribing the teeming population of Ireland to the culture of the potato, we cannot be wrong in ascribing this increase in part to its anti-scorbutic properties, by which

scurvy and its allied diseases must have been largely prevented; and the same must be true, in its degree, of the inhabitants of England and Scotland. There is a sense, then, in which we may be said to have fought our battles with the potato. Perhaps Louis XV. of France had some suspicion of this its prolific virtue, when he wore a bunch of its flowers among his courtiers on a festive occasion; and so brought fashion to bear with effect where philosophy for more than two centuries had utterly failed.

Let us now look at this disease, scurvy, a little more closely. In the first place, let us guard against vulgar errors and misconceptions. Let it be well understood that scurvy is not a scurf or scab on the outer skin, nor a blush which the pressure of a finger will remove, nor a collection of red or white swellings like the nettle-rash, nor a something limited to the head or to some other part of the body; but a collection of round spots or irregular stains, for which it is hard to find a better name than the old one of the London Bills, "*the Purples.*" These spots, or blotches, consist of dark blood poured out beneath the skin. This may be the only outward sign of the disease. But in severe cases the blood escapes into the very flesh of the limbs, making them stiff and painful; and the vessels are so weak that the slightest touch breaks them, and gives rise to every appearance of a bruise. The gums become dark, swollen, and spongy; the teeth get loose and fall out of their sockets; the breath grows very offensive; and blood pours from the mouth, nostrils, and eyes, and from every outlet of the body. At length the gums and the skin become the seats of foul ulcers, old wounds break out afresh, fractured bones long since repaired, are disunited; and the poor sufferer, in full possession of consciousness, is reduced to such extremity of weakness that he will faint on the slightest exertion or least change of

posture, and fall down dead as he is being carried on deck, within sight of the land to which, with its fresh air, fresh meat, fresh vegetables and fruit, he had been looking forward as his certain and speedy cure. To give a perfect idea of the disease, we should have to add the drop-sical affections which mix with, or take the place of, the out-pourings of blood; we must recognise with worthy John Woodall, the "poor miserable man, coming on land from a long voyage," "at the point of death," "swollen to an exceeding greatness; sometimes not able to lift a leg over a straw," nor scarce to breathe, by reason of "strong obstruction." We should also have to note the association of scurvy with fever and dysentery; the spots of the *spotted fever* joined to the *purples* in the London Bills, and the smaller spots of the petechial fevers, being in a sense the manifestations of the scurvy, just as the dysentery, when it constituted the "*bloody flux*" of the bills, owed its discharges of blood to the same cause. In a word, the defective diet of our London ancestry did doubtless bring about a scorbutic state which played a prominent part in more than one of their diseases. There is still another feature of the scurvy well worth noting. It was a disease especially liable to be aggravated by injudicious treatment. Thus Kramer, as cited by Sir Gilbert Blane (he was physician to the Imperial armies in Hungary from 1720 to 1730) "relates that of 400 men labouring under genuine scurvy, treated by one of the medical officers with mercury, so as to excite salivation, in conformity to the doctrines of his master, Boerhaave, not one survived."

Now this terrible disease is sometimes looked upon as a sailor's malady; but this is an error. It is a disease of the land as well as the sea; not the product of sea air or salt provisions. Nor were the diseases associated with it, as scourges of our fleets, peculiar to the sea. The foul

ulcers, dysentery, and fevers, like the scurvy itself, were all common among landsmen similarly circumstanced in respect of food, clothing, cleanliness, and ventilation. The scurvy was especially a disease of seamen, because, while they shared with soldiers, paupers, prisoners, nuns and monks, and the garrisons and inhabitants of besieged cities, the evils of overcrowding, impure air, defective means of cleanliness, and scanty and tainted supplies of water, they were more frequently and constantly than landsmen exposed to the action of the true cause, an in-nutritious and otherwise defective dietary. I shall therefore treat of scurvy, first as a disease of landsmen, then as it affects the sailor.

Now the scurvy, though it may occur in warm climates is, as a rule, a disease of cold and temperate ones. It is common among the northern nations of the European continent, where the diet is very apt to fall short in vegetable elements, and it is accordingly endemic in Iceland, Greenland, Cronstadt, and the northern parts of Russia. Occasionally it has devastated whole kingdoms, as Brabant in the year 1556, and Holland in 1562. It has, doubtless, shown itself as a companion or consequence of famines and scarcities everywhere, especially in cold, damp seasons; and, in the very nature of things, must have afflicted all nations at that stage of their progress from barbarism to civilization, when gardening and horticulture were little practised, and commerce was in its infancy. In the London Bills, scurvy always found a place as a cause of death, and I think that it is easy to recognise it under the name of "the purples" (associated with spotted fever prior to 1701,¹ but from that date to 1728, heading a column of its own). In one year I find scurvy set down as the cause of 105 deaths; in another year "the purples" are credited with 56; and the diseases so commonly associated with scurvy (I mean

dysentery and sores and ulcers) are conspicuous causes of death. The worst form of dysentery, "bloody flux," caused in one year no less than 833 deaths; and sores and ulcers in another, 109. The "*bloody flux*" disappears towards the end of the eighteenth century, being replaced by simple *flux*, and it may be said of all the diseases I have just mentioned, that they disappeared from the Bills, or underwent great diminution with the march of time.

But, as I have said, scurvy is not exclusively a disease of cold or temperate climates: for it occurred in the residency at Lucknow, and it attacked the gold miners of California on the overland journey and at the mines, when the thermometer, in the shade, stood above 100°. But these men, as Dr. Ober tells us, were working hard on a diet of fried bacon or fat pork, with wheaten cakes fried in fat, washed down by brandy or whisky, and copious draughts of strong coffee.

Nevertheless it is in cold and temperate climates chiefly that the scurvy has appeared in its worst forms; in besieged towns, such as Thorn, Breda, Rochelle, and Stettin, in Gibraltar in 1780, at Kars and Sebastopol in our own times, and in Canadian garrisons. Lind tells us that, during the winter of 1756, the English garrison at Oswego was so afflicted with scurvy, that among 700 men they often could not muster 80 fit for duty—a number scarcely sufficient to protect them from the Indians, and that 200 of the 700 died of the disease.

Again, in the winter of 1759, the scurvy broke out among the garrison of Quebec; and these are the terms in which General Murray, the officer in command, speaks of the calamity:—"The excessive coldness of the climate, and constant living on salt provisions, without any vegetables, introduced the scurvy among the troops, which, getting the better of every precaution of the officer, and

every remedy of the surgeon, became as universal as it was inveterate; insomuch that, before the end of April, a thousand were dead, and above two thousand of what remained totally unfit for any service."

Sir Gilbert Blane cites Pliny and Tacitus as recording the outbreak of scurvy in the Roman armies.

Thus did the scurvy do its work of destruction among our soldiers. We shall presently see what havoc it wrought among our sailors.

But I must first give you some account of an outbreak of scurvy that took place in the Millbank Penitentiary in 1822, though this history properly belongs to the first quarter of the nineteenth century.

The prison was built on the Thames, on a piece of made ground, saturated with water, and surrounded by a tidal ditch. The river, a little higher up, received two of the largest of its foul tributaries, took in their waters at high tide, and, thus polluted, filled the ditch and soaked the soil. This water, improved by filtration, the prisoners drank. The building was opened for the reception of prisoners in 1816. Six years later, the epidemic which I am about to describe, occurred; but, in the two years and eight months preceding it, 11 cases of diarrhœa and dysentery, severe enough to be entered in the monthly sick reports, took place; and of these 6 were fatal. The tenants of this damp, foul spot, became, in the years 1822-23, the involuntary subjects of the following disastrous experiment:—

Dr. Hutchinson, then medical superintendent, observing that the prisoners were not merely in high health, but even plethoric, deemed the diet excessive, counselled a reduction, and submitted a reduced scale to the committee. But they foolishly preferred a dietary of their own, which came into operation early in July, 1822. It reduced the solid food from 304 to 168 ounces per week; it also

lowered the meat element to 10 ounces per week contained in the soup; and it struck off the potato element altogether. Now I infer, from a careful comparison of this with other dietaries, both of prisoners and paupers, that this reduction in quantity, and in the meat element, was not adequate to the production of the epidemic that followed, even if we take into account the unhealthy site, the objectionable water supply, the cold winter that followed, and the low temperature of the prison cells at night. I believe that I am justified in ascribing the sickness that so soon followed the reduction, to the entire omission of the potato. Let us now look at the consequences. The new dietary came into use, as I have said, early in July, 1822; in the autumn following, the prisoners grew feeble and languid, and a few slight cases of scurvy showed themselves; but in the months of February and March, 1823, scurvy, associated with diarrhœa and dysentery, became so prevalent that more than half the prisoners were attacked, and by April 5th, 6 died of dysentery. All these diseases were cured by a reformed diet, and medical treatment; but the diarrhœa and dysentery reappeared with great severity in the summer and autumn of 1823, in company with fever and nervous affections, so that the prison had to be closed for several months, and the prisoners to be removed. The severe nervous and mental maladies to which I have referred add a feature of peculiar interest to Dr. Latham's admirable account of the epidemic. The subject, in all its fulness and completeness, belongs, as I have said, to the sanitary history of the first quarter of the nineteenth century. I treat it now as part of the history of land scurvy; and as an illustration, supported by many analogous occurrences, of the immense value of the potato as an element of all dietaries from which other vegetables, as well as fruits, are shut out. This simple

dietetic principle requires to be specially borne in mind in these days, when large establishments for the custody and care of paupers, prisoners, lunatics, aged persons, children at school, soldiers and sailors, and sick people, are so rapidly on the increase.

I now proceed to treat of scurvy as it shows itself at sea, and among sailors.

About a century ago, a vessel of war might seem to have been equipped and provisioned with a view to the production of the greatest possible amount of disease in the shortest possible space of time. Beef badly salted, and often so rotten that, before boiling it, it was necessary "to tie it round with cords;" biscuits mouldy and full of "weevils or maggots;" and puddings of salt, suet, and flour, made up the dietary. The water was often so thick and green from decomposition and vegetable growth, and so offensive withal, as to disgust sight, smell, and taste. The ship was damp, filthy, and ill-ventilated, and the air of the wells so foul as often to produce fatal asphyxia. Personal cleanliness was neglected; the clothing was insufficient, and the bedding too, the men having to turn in between blankets unwashed perhaps for a year; little effort was made to amuse the mind, and none to instruct it; the sailor's only luxury an exorbitant allowance of spirituous liquors, at sea, as on land, the fruitful source of disease, misery, insubordination, and crime. Add to all these privations and discomforts a discipline not merely strict but severe, and punishment often inflicted at the instigation of momentary passion, and we have a lively and faithful picture of the naval service at the period to which I refer. This state of things was subject to slow and interrupted improvements; but Dr. Fletcher, a naval surgeon, writing in 1786, not only confirms the sketch I have given in every particular, but adds to it some serious aggravations. When these foes of

health were doing their work, and scurvy, dysentery, and fever were reinforcing the enemy, we might suppose that power would be given to the captain or surgeon to procure a supply of the known remedies. But alas! *red tape* was as active and efficient in those days as we knew it to be in the Crimean War. Take this case, on Dr. Fletcher's authority, as an illustration:—"When his Majesty's ship the *Roebuck*, with some others, under the command of Sir Andrew Hammond, refitted at Antigua, there were a number of men attacked with yellow fever, &c.," "sent to hospital." The doctor "was surprised to find that the sick were not liberally supplied with fruit, especially as oranges were plentiful and very cheap." But they were not given because "Government might possibly think such expense too great." He, therefore, expended half a dollar a day on oranges for some thirty of the *Roebuck's* crew, with the happy result of quicker recoveries and fewer deaths than happened among the sick from the other ships. And this was no isolated occurrence; for the same authority tells us that a fleet might be stationed three years in the East, without the men being ever able to come at the fruits of the country; a state of things which he justly compares to the strange practice of the ancients in prohibiting all kinds of drink to patients in ardent fevers.

The consequences of the state of things I have been describing were, as you may suppose, eminently disastrous. Scurvy, putrid ulcer, malignant dysentery, and fever allied to that of jails (indeed, often directly imported from them, as testified by Howard and others) suddenly swept off the greater part of many ships' crews, and well nigh depopulated whole fleets. Scurvy alone, without any aid from the other diseases I have just named, has sufficed to place a well-manned vessel at the mercy of the winds and waves. Witness Anson's own ship, the

Centurion, in 1742; when the crew were so weakened by it that had the ship been compelled to keep the sea a very few days longer, it could not have been brought to an anchor at Juan Fernandez, but must have gone adrift in the Pacific, the survivors perishing miserably, as once happened to a Spanish ship under the like circumstances; or take the figures that express the mortality in Anson's fleet:—out of 961 men, 626 deaths in nine months, or very nearly 2 out of 3! And this was no rare or exceptional occurrence, for such things had happened in earlier and did happen in later times. Thus Sir Richard Hawkins, the great navigator of the age of Elizabeth and her successor, said that, in the course of twenty years he “had known of 10,000 seamen having perished by scurvy alone.” Even so late as 1780, Sir Gilbert Blane found that a fleet manned with between 7000 and 8000 seamen, had in one year lost one in every seven. Fortunately for us, this high mortality was not limited to our own ships; a Portuguese historian, cited by Sir Gilbert Blane, speaking of the favourable case of an exploring expedition, says that “if the dead who had been thrown overboard between the coast of Guinea and the Cape of Good Hope, and between that Cape and Mozambique, could have had tomb-stones placed for them, each on the spot where he sank, the whole way would have appeared one continued cemetery.”

The disastrous consequences of this excessive sickness and mortality in time of war may be readily imagined, but it may be well to give a few illustrations:—

1. Sir Francis Wheeler's expedition to the West Indies and North America, in 1693, consisting of two ships of the line and six frigates, miscarried in the attack on Martinique, through the force being weakened by diseases; and in his return voyage his crews were so reduced by deaths

from scurvy and fever that there were hardly hands enough to bring the ships to anchor.

2. Admiral Hosier, employed with seven ships of the line in the year 1726, to protect the trade of the West Indies, buried his ships' companies twice over, and in place of quelling and coercing the Spaniards, was defied and insulted by them, and died of a broken heart.

3. To this excessive sickness and mortality Sir Gilbert attributes the failure of our arms in six general engagements of the Seven Years' War, and the American War, every one of which was a drawn battle, through deficiency of hands and want of strength in those who fought, due to excessive sickness and mortality.

It was to facts such as these that Thomson alludes when he speaks of the diseases that

“at Carthage quenched
The British fire.”

and pictures the “gallant Vernon” looking on “pitying” but helpless, at the terrible ravages of disease and death.

And yet, even in those times, when other sanitary measures must have been either neglected or imperfectly carried out, there were not wanting striking examples of single ships and whole fleets maintained in perfect health and complete efficiency by fresh meat, vegetables, and fruit, or by strictly observing some dietetic precaution. I will give you one or two cases:—

1. Fletcher tells us that he had been in a Channel cruiser when the water for above a week was more fœtid than the very worst bilge-water, so that the men were “obliged to suppress their sense of smelling” when they used it; and yet their health was never better. They had fresh meat and vegetables. And he adds that when the *Swallow* was up the Ganges, and her water was taken in

under the most unfavourable circumstances, no complaint ensued; "most assuredly owing to their supply of tea and fresh meat." What these unfavourable circumstances were, we learn from another passage, where he tells us that his ship was ordered three times up the Ganges in the very worst seasons; when the thermometer stood at 89° , when an exposure for a few minutes upon deck wetted them to the skin, when the dead bodies floated on the stream in such numbers that it was difficult to make a passage among them; and yet, on all these occasions, they left the river without losing a man; a result which Fletcher attributed solely to the tea and sugar which the men, taught by experience, bought each time they entered the river.

2. The same author gives us an instance on a larger scale, showing the preservative virtue of fresh provisions. It relates to the victory of Admiral Hawke, in 1747. 14,000 men, in 20 ships of the line and 12 frigates, had been pent up in their ships for six or seven months in the Bay of Biscay and on the coast of France; and yet, on the day of the fight there were not 20 sick sailors in the whole fleet; in the *Royal George* and in the *Union*, of 770 men, only 1 man unfit for duty; and on board the *Mars*, of 64 guns, not a sick person. "This most extraordinary degree of health is entirely attributed to the fleet having been well supplied with fresh meat and greens;" and he adds that, when the victualling transports were detained by contrary winds, and the supplies cut off, they became very sickly.

These are cases of scurvy prevented: here are instances of scurvy cured; the first on the authority of Dr. Mead:—When Sir Charles Wager commanded the Baltic fleet, his sailors were terribly afflicted with the scurvy. But fortunately, he had taken in at Leghorn a quantity of lemons and oranges, and recollecting that he had often heard how effectual they were in the cure of the scurvy, he caused a

chest of each to be opened every day. The men ate the fruit, mixed the juice with their beer, and reached home in good health.

Mr. Murray, a naval surgeon of large experience on board ship and in hospital, quoted by Lind, after speaking in high commendation of oranges and lemons as an infallible cure in every stage and species of the disease, if there was any natural strength left, and no flux, says that at the Danish island of St. Thomas 120 patients, in all the different stages of this distemper, were cured in little more than 12 days by limes alone, little or no other refreshments being obtainable.

Lind gives us another instructive history, which I will present to you in a condensed form :—In the East India Company's first voyage, four ships were under the command of Captain James Lancaster. His ship had a crew of 202 men ; the three others, among them, 222. They left England about the 18th of April, and in July the scurvy broke out. " By the 1st of August all the ships, except the captain's, were so thin of men, that they had scarce enough to hand the sails ; and, upon having a contrary wind for 15 or 16 days, the few who were well before began also to fall sick ;" so " that the merchants who were sent " with " their cargoes," " were obliged to take their turn at the helm, and do the sailors' duty, till they arrived at Saldania," where the crews of the three ships were in such a condition that they could hardly let fall an anchor, nor hoist out their boats, without the assistance of the captain's crew. And " the reason why his crew was in better health than the rest of the ships, was that, having brought some bottles of lemon-juice to sea, he gave to each sailor, as long as it lasted, three spoonfuls every morning fasting. " By this he cured many of his men, and preserved the rest."

Having, in my last lecture, spoken of the efforts of

Sutton and others to introduce fresh air into our ships, I must not omit to cite a fact which I find in Fletcher's work :—The ships of the line, *Prudent* and *Intrepid*, sailed from England for the East Indies at the same time, and under apparently similar circumstances. "The *Prudent*, however, lost three times as many men as the *Intrepid* : this at first seemed matter of surprise, till at length it was resolved into its proper cause. The *Intrepid* had scuttles cut between-decks, and the *Prudent* none, by which a free circulation of air was maintained in the *Intrepid*, when the lower deck-ports could not be kept open upon account of bad weather."

The account I have given you of the scurvy, and the cases I have cited, will have prepared you to appreciate the history of the expedition of Anson, in 1740, so often brought into comparison with Captain Cook's first voyage, in 1772. I have made a minute and careful analysis of the facts of Anson's expedition as given by Richard Walter, chaplain to the *Centurion*; with the result, I am sorry to say, of destroying another delusion, and compelling a material modification of the views which, in common with Sir John Pringle, Sir Gilbert Blane, and other good sanitary reformers, I had been led to entertain.

On the 18th of September, 1740, Anson set sail from St. Helen's; and, on the 15th of June, 1744, anchored at Spithead, having been absent from England three years and nine months. He left with six vessels of war, and two victuallers, and came back with his spoils, and a reputation richly earned, but with a single ship—his own *Centurion*. Our interest centres in three of these six ships—the *Centurion*, the *Gloucester*, and the *Tryal*, and the 961 men who formed their united crews. Such crews, we may hope, were never, before or since, brought together to tempt Providence and try the metal of a gallant commander. Of the seamen some were drafted direct from hospital and sick quarters.

The land forces were men mostly sixty years old, some upwards of seventy, the worst half of a batch of invalids, of whom the younger and more active had deserted. In lieu of the deserters, Anson was furnished with 210 "raw and undisciplined" marines, with "scarcely more of the soldier than the regimentals." Some of these, too, had been lately discharged from hospital. I gather from facts stated in the narrative that Anson's own ship, the *Centurion*, left England with a crew of 506 men; of whom 79 were raw marines, and 50 aged invalids; and I infer that the other crews were made up much in the same way. With crews composed in part of this "aged and diseased detachment," "crazy and infirm," "decrepit and miserable;" in part of raw undisciplined marines, did Anson start on his perilous expedition, at the worst possible season of the year, his ships so deeply laden as to offer a serious impediment to ventilation; and with the knowledge that a Spanish fleet of greatly superior force was on the look-out for him.

Now the part of the expedition in which we are interested may be divided into four sea voyages and three sojourns on land: a run to Madeira, occupying 37 days; thence to St. Catherine's, 47 days; thence to St. Julian's, 30 days; and from St. Julian's to Juan Fernadez, 105 days—in all, 219 days at sea. Nine days at Madeira, 29 at St. Catherine's, and 10 at St. Julian's, make up a total of 48 days on land. From England to Juan Fernandez the time was 267 days, or somewhat less than 9 months. I will state what took place during this 9 months as briefly as I can.

The run to Madeira occupied 37 days, instead of the usual 10 or 12; and the crews suffered from the fevers then known as Calentures. The *Centurion* lost two men. The ventilation being recognised as inadequate, 6 air-scuttles were ordered to be made in each ship, and a

supply of water, wine, and other refreshments was laid in. The 47 days' run to St. Catherine's produced a serious sick-list. 80 men were landed sick from the *Centurion*, of whom 28 died; and yet by the time they left the island, the 80 had become 96. These were embarked, and in 30 days they reached Port St. Julian, which place, after a stay of 10 days, they left in good spirits, and, as I gather, in good health. It was the 105 days spent between St. Julian and Juan Fernandez, amid storms, cold, frost, and deluges of water, under unparalleled exposure, fatigue, and privation, that occasioned the greater part of the sickness and mortality of which I am presently to give the summary. In about 10 days after leaving St. Julian the scurvy began to show itself, and in less than two months it had spread to such a degree that there were few on board free from it. Soon after, we read of 42 dying on board the *Centurion*, then in the month following, double the number, and by the time the ship arrived at Juan Fernandez there had been a loss of upwards of 200 men, and they could not "muster more than six foremast men in a watch capable of duty," and even some of these were lame and unable to go aloft. I must not detain you with further details of the sickness and death on board the *Centurion*, or with the adventures of the *Gloucester* and *Tryal*. Suffice it to say that, in the short space of less than nine months, the time spent between England and Juan Fernandez, the crews of the three ships had lost 626 out of 961. Or, if we limit ourselves to the *Centurion* and its crew, concerning which we have the most exact information, it appears that, in less than 9 months, her 506 men were reduced to 214, her 50 invalids to 4, and her 79 marines to 11. Of this frightful mortality, by far the greater part occurred in the stormy and every way inclement weather, encountered in rounding Cape Horn, in the two months and a half that elapsed

between leaving Port St. Julian and arriving at Juan Fernandez.

It belongs to this sanitary history to state that at Madeira, St. Catherine's, St. Julian, and Juan Fernandez, the foul ships were refitted, cleansed, and purified, and that no sanitary precaution seems to have been neglected.

Nor were these measures ineffectual, for we are told that for some time after leaving Juan Fernandez, the crews had "enjoyed a most uninterrupted state of health." But on leaving the coast of Mexico, the scurvy again began to show itself, and this time it was not possible to attribute it to the stormy and inclement weather, though that which they soon had to encounter doubtless added much to their sickness and mortality. At this time the crew of the *Gloucester* was reduced to 77 men and 18 boys, of which number only 16 men and 11 boys were able to keep the deck, and of these several were infirm. This ship had to be burnt, and her crew transferred to the *Centurion*. There were 70 sick among them, of whom "3 or 4" died as they were being hoisted on board. And soon we find that the deaths of the consolidated crews were "extremely alarming," that no day passed that they did not bury 8, 10, or 12, and that "those who had hitherto continued healthy, began to fall down apace." When they were able to land on the island of Tinian, they put on shore 128 sick, many of whom were carried on the backs of the Commodore and his officers. On that and the previous day, they buried 21 men, and 10 more soon after. Anson himself, as we learn, did not escape the scurvy.

This new attack of scurvy occurred under circumstances so different from the first as to puzzle the surgeon and the chaplain. They had fresh provisions in the shape of hogs and fowls, they caught fish in abundance, they had an ample supply of fresh water; they kept all

their ports open, "and took uncommon pains in cleansing and sweetening the ships." But no mention is made of vegetables or fruits, and they owed their supply of water to rains which must have kept the atmosphere moist, and so far unfavourable to them.

The crews recovered their health at Tinian, and all that now remains of this sanitary history, is the simple statement that, when Anson came to muster the remnant of the united crews of the *Centurion*, the *Gloucester*, and the *Tryal* on board his own ship, prior to his attack on the Manila galeon, he had in all only 227 hands, of whom nearly 30 were boys, and 23 lascars and Dutchmen, besides other recruits picked up here and there. So that, out of the original 961 with which Anson left England, the survivors probably fell very far short of 200.

Of the Spanish squadron of Pizarro, all that I have time to say is, that while our men were dying of scurvy, the Spaniards were perishing in large numbers of simple starvation; and that out of a fleet of six vessels, with 278 guns, 2700 men, and a regiment of soldiers, the Admiral's vessel, the *Asia*, alone survived, with a miserable remnant of 100 men.

Need I add that all that part of this successful, though disastrous, expedition which does not relate to sanitary matters, constitutes a romance of real life which no Englishman should omit to read. It affords a curious illustration throughout, of what skill, courage, and conduct can do to meet and overcome gigantic difficulties; and, at the same time, it must be confessed, an example of the truth of the proverb which asserts that brave men are fortune's favourites. To pass through a hostile French fleet in a dense fog, with his treasure and remnant of brave men, was the crowning incident of an expedition which had abounded in happy turns of fortune.

I prefaced this account of Anson's voyage by stating

that the close and careful study of it had led me to modify the views which, following the lead of Pringle and Blane, I had once adopted. I must now explain myself; and, in order that I may do so, I must remind you of a few facts relating to Cook's first voyage. He left England in 1772, just 32 years after the date of Anson's departure, was absent from England 3 years and 18 days, sailed round the world, and returned with the loss of 3 men by accident, and 1 by pulmonary consumption, out of a crew of 118. This was undoubtedly a most happy and favourable result, and we cannot be surprised that Captain Cook, being a Fellow of the Royal Society, should wish to tell that learned body how it had been brought about. This accordingly he did in a paper addressed to the Society, under date March 5, 1776. This paper the Society honoured with the Copley medal, and Sir John Pringle, the President, in presenting it (Captain Cook was then absent) pronounced upon the author and his work a well-deserved eulogium. In it he gave an excellent summary of Anson's expedition, and did the commander the justice of pointing out that the preparatory arrangements of the voyage were not made by himself; that his ship was so deep in the water that the ports could be opened only in the calmest weather; and that he neglected nothing for preserving the health of his men that was then known and practised in the navy. But the other serious drawbacks I have pointed out are not mentioned; and the subject is so treated as to have led Blane and others to use Anson's disastrous failure as a standard of comparison by which to measure Cook's admitted success. Now the sketch I have just given of Anson's expedition, by showing you that the facts were even worse than they are usually represented to be, and by reducing the time within which the great destruction of life took place, does but serve to strengthen the case as a sanitary lesson. But when all the facts are taken

together—the fact that it was a warlike, not an exploring, expedition ; that the strange crews were forced upon him instead of being chosen by him ; that his ships were so built and fitted as to render ventilation most difficult ; that he was sent out without any special provision being made for the health of his men at the very worst season of the year ; that he encountered, in rounding Cape Horn, the very weather which compelled the greatest amount of exertion and exposure, rendered ventilation for many days together simply impossible, and by the union of cold and moisture was eminently favourable to the production of scurvy ; it must be obvious that we have here no fitting standard of comparison by which to measure Cook's merits and success. This being understood, we may give him all the praise his care and vigilance deserve. But, as this did not suffice wholly to prevent the scurvy, though it never failed to cure it, it is easy to imagine how the picture would have been reversed had Cook had to contend with Anson's disadvantages and difficulties. Though I have the most unfeigned admiration for Captain Cook, and am unwilling to say a word in his disparagement, I must observe that there were men before his time, as there have been since, who deserve the credit of the same conscientious care, with the like happy results. As an instance of the first kind, take Captain McBride in the *Jason* frigate, supplied with malt as a preventive, and instructed by his brother's writings, two years and more at the Falkland Islands, and losing only one man by apoplexy from intoxication ; and, as an example of the second order, the exploring expedition of Captain Parry to the Polar seas. The *Fury* and *Hecla*, “with no resources but what they carried with them,” were absent from England 27 months, and though both men and officers suffered from scurvy, returned with a loss of only 3 men out of their united crews of 118—the exact number of Cook's crew in the *Resolution*.

It was Captain Cook's unquestioned merit, then, that gave him a foremost place among the promoters of sanitary measures in the navy; but it was his connexion with the Royal Society, and the honour he received at its hands, that caused his name to be associated with the Scurvy as the man who, above all others, had illustrated the right methods of preventing and curing it. To have conducted an exploring expedition and 118 men round the world, through every variety of climate, during more than three years, with the loss of only one man by disease, was doubtless a great achievement, honourable to himself and the gallant service of which he was so distinguished an ornament; of a piece with his philanthropic life, in keeping with his noble death.

Captain Cook's first voyage may be looked upon as one of those conspicuous illustrations of a great principle which have more than once given a much needed impulse to some great movement of reform. Such a movement, tending towards the improvement in the health of seamen was in progress through the greater part of the eighteenth century; promoted at one time by some fearful sacrifice of life, such as that which attended Anson's expedition, at another by some signal success in preserving health, such as was Cook's first exploring voyage. The work was slow and interrupted; the lessons of experience were soon forgotten; the ruling powers were hard to move; and ventilation soon fell into disuse, in spite of all that had been done by Desaguliers, Hales, and Sutton. Lemon-juice, though recommended by Woodall, and actually supplied to merchant ships as early as 1617, was not introduced into our navy till 1796, prior to which date navy surgeons had to supply medicines at their own cost. It was not till 1781 that what were called *slop-ships* (which may be briefly described as floating baths-and-wash-houses, and clothing establishments, by which recruits and pressed

men might be passed on into the service in a decent and healthy condition)—it was not till 1781 that these were substituted for small tenders and receiving ships. It was not till late in the century that improvements were made in “the situation, fitting, and furniture of the *sick-berth*.” The separation of the sick from the sound, measures for cleansing and drying ships, the use of preserved meats, the substitution of wine and tea for spirits, the employment of quicklime for purifying the water taken on board, the supplemental use of distilled water, the promotion of personal cleanliness by inspection at stated periods—these, and other obvious sanitary ameliorations and precautions, assisted by many improvements in the construction of vessels (such as copper-sheathing, first introduced into our navy in 1761), came gradually into operation; and with vaccination, and the supply of lemon-juice, must have greatly improved the health of our sailors by the end of the eighteenth century. It is the period preceding the end of the eighteenth century, then, that we must bring into comparison with the early years of the nineteenth, when our ships were fully supplied with all the means and appliances of health, if we would understand and appreciate the value of sanitary science. These are the facts as given by Sir Gilbert Blane.

In 1779, 70,000 men were voted for the service of the navy; of these 28,592 were sent sick to hospital, and 1658 died. In 1813, out of just twice the number (140,000), 13,071, were sent to hospital, and 977 died. In 1779, therefore, the sick were more than 2 in every 5, and the deaths 1 in every 42; while in 1813, the sick were about 2 in 21, and the deaths 1 in 143, the sickness reduced to a fourth, the deaths to little more than a third!

I will give you one other numerical statement. I extract from one of Sir Gilbert Blane’s tables all those

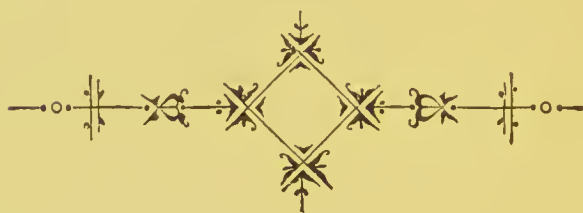
years in which the number of seamen and marines voted by Parliament was the same, namely 120,000; and I give you the sick for those years. They form, as you see, a descending series:—20,544 in 1797, 15,713 in 1798, 14,608 in 1799, 8083 in 1805, 7662 in 1806. Or, take a similar comparison where the numbers voted were in each year 100,000: the years 1782, 1795, and 1804. The figures for the sick are 22,909, 20,579, 7650.

These figures speak for themselves; they are very eloquent. I will add, from the same authority, a statement of a more general kind. The Channel fleet, in the year 1800, kept the sea for four months without one vessel being in port, and brought back only 16 subjects for hospital; while only twenty years before, the same fleet was so overrun with scurvy and fever as to be unable to keep the sea for ten weeks together.

Is it possible to imagine a more conclusive demonstration than these facts afford of the reality and importance of the science and art of hygiene? If it be true, as it undoubtedly is, that by improvements in diet, water-supply, and ventilation; in clothing and cleanliness; aided by superior medical treatment, and especially by vaccination; and by an improved discipline, tempered by mental culture and amusement—if it be true that these improvements and reforms have saved life and prevented sickness to such an extent, that the effective force of our navy has been more than doubled, that one ship, for every purpose of navigation and warfare, is at least equal to two of the same size and force, that a vessel can now keep the sea for twice or thrice the time that was possible less than a century ago; if it be true that, at the old rate of mortality, all Europe could not have furnished the seamen necessary for our defence and safety during the great revolutionary war: then is it a mere waste of words to argue that health, which is the strength of all who

work, is the great source of power to nations in their peaceful labours, as in their warlike struggles.

I have devoted the greater part of this lecture to the navy, because the facts connected with that branch of the public service are more demonstrative of the efficacy of measures of prevention in rooting out the Scurvy than any which the records of the army afford. But you will infer from what I have said of Scurvy as it shows itself on land, especially in besieged places, that the knowledge we have acquired by the study of the disease as it occurs at sea has not been lost on those whose duty it was to promote the health and efficiency of the army.



LECTURE VII.

THE JAIL-DISTEMPER.

THIS lecture will be, from beginning to end, a Romance of History. I shall first give you some account of a singular disease, fatal to individuals, disastrous to the State, and believed to have been peculiar to the prisons of England. I shall then lay before you a description of the condition of our prisons a century ago, which, if it were not strictly true, would be simply incredible. This done, I shall tell you by whom and by what means that state of things was reformed and amended; and lastly, I shall give a sketch of the life and acts of John Howard, of which life and acts, as of the abuses he reformed, it may be said that they too, if not true would be incredible.

The jail-distemper, of which I am to treat in this lecture, is a very ancient malady. Howard, on Stow's authority, traces it as far back as the year 1414, when "the gaolers of Newgate and Ludgate died, and prisoners in Newgate to the number of sixty-four." Dr. Robert Williams, in treating of the typhoid poison, cites a passage from Wood's History and Antiquities of Oxford, to the effect that a contagious fever "broke out at the assize of Cambridge, when held in the castle there, in the time of Lent, 13 Henry VIII., 1521-1522. For the justices there, and all the gentlemen, bailives, and others resorting thither, took such an infection that many of them died, and almost all

that were present fell desperately sick, and narrowly escaped with their lives." To these early notices it is usual to add Lord Bacon's testimony that "The most pernicious infection, next to the plague, is the smell of the jail, when prisoners have been long, and close, and nastily kept; whereof we have had in our time experience twice or thrice; when both the judges that sat upon the jail, and numbers of those that attended the business or were present, sickened upon it, and died."

Next in order of time to the outbreaks of 1414 and 1521 comes the notorious Black Assize at Oxford, in 1577. I quote from Holinshed. At the assizes held the 4th, 5th, and 6th days of July, one Rowland Jenkes was arraigned and condemned "for his seditious toong," "at which time there arose amidst the people such a *dampe*" (an old mining expression) "that almost all were smouldered, very few escaping that were not taken at that instant:" "the jurors died presently, shortly after died Sir Robert Bell, Lord Chief Baron," with twelve others whose names are given. There died in the town of Oxford 300 persons, and there sickened there, but died in other places, 200 and odd from the 6th of July to the 12th of August, after which day there died not one of that sickness, for one of them did not infect another, nor did any one woman or child die of it. We learn further that the disease was attended by hæmorrhages; and "that those that bled till they died, strove so much with their sickness, that the blood issued out of their vents: but yet had perfect memory, even to the yielding of their breath." The account given by William Martin confirms this; and he adds, "all that were present, almost every one, within 40 hours died, except women and children, and no others were touched with the contagion." This Black Assize occurred, be it recollected, in 1577; and it is to this period that another statement quoted by Howard from

Stow's Survey relates. Speaking of the King's Bench Prison, he tells us "that in the six years preceding the year 1579, one hundred prisoners died there, and twelve between Michaelmas and March of the last mentioned year," "through a certain contagion called *the sickness of the house*."

The jail-distemper must have been very rife in the last quarter of the sixteenth century ; for it showed itself not only at Oxford and in London, but also at Exeter. The date of its outbreak in this city was March 14, 1586, and the occasion was the city assizes held before Sir Edmund Anderson, Lord Chief Justice of the Common Pleas, and Serjeant Floredaie, a Baron of the Exchequer. Holinshed, from whose chronicles I extract this account, describes it as a very sudden and strange sickness, appearing first among the prisoners of the gaol of the castle of Exon, from whom it was dispersed, upon their trial, among sundry other persons. It was very sharp for the time, and few of those first attacked escaped. It was *contagious and infectious*, but not so violent as the plague commonly is ; and there was no outward ulcer or sore. There were various opinions as to the cause of the disease. Some attributed it to the "contagion of the gaol," the "close air" and "filthy stink" of which soon affect most prisoners "newly come out of the fresh air." "This is commonly called the *gaole sicknesse*, and many die thereof." Others imputed the disease to "certaine poor Portingals," about eight and thirty in number, whom one Barnard Drake had captured at sea, and brought into Dartmouth haven, whence they were sent to the castle gaol, and "cast into the deepe pit and stinking dungeon." These men had been long at sea, in a ship from Newfoundland, laden with fish ; without change of apparel, and without beds to lie upon. Most of them were sick, some died, and "some one of them was distracted." This

sickness soon spread among the other prisoners, of whom many died and the rest "hardly escaped."

Many of these prisoners when brought to trial were so weak that they had to be led, or carried from the jail on hand-barrows; and the sight of them, more like "hunger-starved than with sickness diseased," moved the Lord Chief Justice and others to pity, and to certain reforms and improvements.

The prisoners, after being rested and kept for a time in the air, were brought into court, when an "infection followed" upon many that were there, and especially upon such as were nearest. The effect was not immediate, for every one went away in as good health as he came; yet, after a few days, the disease showed itself, and more died than escaped. Many of the sufferers were of "good account," and the list comprises several names now well known in the county. Of the common people also, many died; and especially constables, reeves, and tithing-men, and jurors, and "namely, one jury of twelve, of which there died eleven."

This sickness was dispersed through the shire, and was not extinguished in October, 1586, when this account was written. The period of incubation, as we should now call it, was fourteen days or more, but some, we infer, must have sickened in "a few days." Its moral effects are thus described. At its first coming it frightened the people, and led many men to pretend, rather than to perform, amendment of life. "So long as the plague was hot and fervent, so long every man was holy and repentant: but with the slaking of the one, followed the forgetfulness of the other."

Three considerable outbreaks of jail-fever occurred in the eighteenth century—in the interval between the years 1730 and 1750. The first at Taunton, in 1730; the second at Launceston, in 1742; the third in London, in

1750. The Taunton case is mentioned by Howard, in these words. "At the Lent assizes, in Taunton, in 1730, some prisoners, who were brought thither from Iwilchester gaol, infected the court; and Lord Chief Baron Pengelly, Sir James Sheppard, serjeant; John Pigot, Esq., sheriff, and some hundreds besides, died of the gaol distemper." Of the outbreak at Launceston, Huxham gives us some interesting particulars in his "*Observations on the Air and Epidemic Diseases*," for April, 1742. The disease was "a contagious putrid fever," "very pestilential," both exhausting and oppressive; attended with tremblings, twitchings, restlessness, delirium; with early phrensy and lethargy in many instances. The tongue was dry and black, the breath offensive, and the skin spotted with black petechiæ. An offensive diarrhœa "brought numbers to their end." This fever "took its rise from prisons, was disseminated far and near by the county assizes, occasioned the death of numbers, and foiled frequently the best advice." "Those who bled too profusely killed the patient infallibly, and not the disease." Huxham saw three cases of this fever. One patient, a gentleman, died on the 13th day from his seizure, "stupid, delirious, and covered over with purple spots and livid pustules."

I take my account of the jail-distemper of 1750 from Sir John Pringle's "*Observations on the Jail or Hospital Fever*." "In the year 1750, on the 11th of May, the sessions began at the Old Bailey, and continued for some days; in which time there were more criminals tried, and a greater multitude was present in the court, than usual." The prisoners, about a hundred in number, were crowded into two rooms, measuring 14 feet by 11, and 7 feet high, and in the bail-dock (a small corner enclosure, open at the top), into which were put some who had been under the closest confinement. The court itself was about 30 feet

square; and into this narrow and crowded space the air from the bail-dock and the two small rooms found easy access. An open window, "at the furthest end of the room from the bench," occasioned a draft in the direction of those who were found to have suffered most. These were the persons on the bench, of whom four were attacked and died, namely, Sir Samuel Pennant, the Lord Mayor; Sir Thomas Abney and Baron Clarke, judges; and Sir Daniel Lambert, alderman. The other victims were two or three counsel, an under-sheriff, several of the Middlesex jury, and others, to the amount of above 40. This list is exclusive of persons of a lower rank, and of those who did not sicken within a fortnight. "This sickness, as far as was known, spread no further." Sir John raises the question, "whether the air was most tainted from the bar by some of the prisoners then ill of the jail-distemper, or by the general uncleanness of such persons?" But he thinks it "probable that both causes concurred." The sufferers are said to have "soon become delirious," and several to have had spots upon the skin. The fever was extremely fatal. "All that were seized with the fever died, excepting two or three at most." Such is Pringle's account of the sixth and last of the *Black Assizes*. It differs in one or two points from the notice of it at p. 102 of Murchison's treatise on the "Continued Fevers of Great Britain," to which I refer you; but it is all that is needed for my present purpose.

Now, there is reason to believe that these Black Assizes were a few only of many similar outbreaks of which we have no detailed accounts; for it is highly improbable that a disease which showed itself thrice in the sixteenth century and thrice in the eighteenth, should have had no existence in the interval between 1586 and 1730. And this view of the case is confirmed by what Lord Bacon says of the disease. There had been in his day "experience twice or

thrice" of this jail-distemper; and Dr. Lettsom, writing in 1774, refers to "some recent instances at the Old Bailey, and in the last Lent circuit;" and to "the fatal transaction at Salt-hill."

Let me here observe that, though I began this lecture by speaking of the jail-distemper as peculiar to the prisons of England, I did not wish to ignore the fact that it has been known to occur in Ireland too. Thus I find in the "*Gentleman's Magazine*" for 1776, that, "In Dublin a malignant fever, occasioned by a criminal infected with the jail-distemper being brought into the Court of Sessions without cleansing, produced very fatal effects, and alarmed the whole city." The names of eight of the victims are given, besides several attorneys and others who had to attend in court.

The jail-distemper, then, on many occasions, made the legal service of the State a service of danger; but the mischief did not end here: it interfered with the due course of justice by the terror it inspired. Thus, I find it stated in the "*London Packet*," under date March 25, 1774, that an "invidious report" that "the gaol distemper prevailed at Launceston having been spread abroad, great pains were taken to disabuse the public, and two of the faculty were sent to Exeter to state on oath that no such distemper prevailed there. But the judges were afraid to see them, and the gentlemen of the bar, alarmed by the recent death of Baron Adams, attributed to the fever, retired, some to Bridgwater, others eastward; so that Judge Aston had to adjourn the court."

Thus did the jail-distemper do its work of destruction and disorganization in our courts of law. Let us see how it conducted itself towards the general population of the country.

1. Howard tells us that "At Axminster, a little town in Devonshire, a prisoner discharged from Exeter Gaol

in 1755, infected his family with that disease ; of which two of them died, and many others in that town afterwards."

2. At page 26 of the "Medical Memoirs of the General Dispensary," it is stated that a prisoner dismissed from Newgate, apparently in tolerable health, in four days afterwards was seized with the symptoms of a malignant fever, and infected eleven persons who were attacked by the same disease the next week. He was thought to have received the infection before he left Newgate ; but he retained the clothes he had worn there.

3. Mr. Field, chaplain of the Reading County Jail, gives the following incident, from the diary of the Rev. T. Scott. In 1780, a baker living at Stoke, in Buckinghamshire, allowed a poor man with a large family, to contract a debt of 10*l.*, and then arrested him, thinking that the overseers would pay the sum rather than let him be thrown into prison. But they disappointed him. The debtor was sent to Aylesbury jail, where the fever then prevailed, and took the disease. His wife went to nurse him ; he died. She returned home, sickened, and died. The malady spread in the village, sparing the children, but proving fatal to the parents. Forty children were believed to have been bereft of one parent, and nearly twenty of both. The same fever had broken out at Northampton as well as at Aylesbury.

4. In these three instances, the jail-distemper was communicated to the outside population by the discharged prisoner himself. I add one instance in which, like the plague of old and the small-pox, the disease was carried in the clothes. A man of the name of Russel, whom Dr. Lettsom attended in Wood Street Compter, died of the gaol fever : he had a large family, who lodged near Fleet Market ; and after his death his widow took his clothes there, and probably used some of them ; for, about a week

after, "herself and the whole family were attacked with a malignant, or jail fever, and with difficulty survived."

This jail-distemper, which thus infected our civil population, was one of the worst scourges of our armies and fleets.

Pringle tells us that "gaols have often been the cause of malignant fevers," and that, in the rebellion in Scotland, above two hundred men of one regiment were infected by deserters brought from English prisons; and this is not the only instance he gives.

To the same effect is the evidence of Lind as to the importation of the jail-distemper into our fleets. Howard states that he showed him, in a ward of Haslar Hospital, a number of sailors ill of the jail fever, brought on board their ship by a man discharged from a London prison; and Lind, in his work on the Health of Seamen, asserts that "the sources of infection to our armies and fleets are undoubtedly the gaols;" that the disease could often be traced directly from them; and especially in impressing men on the hasty equipment of a fleet. "The first English fleet sent last war to America, lost by it above 2000 men;" and Lind elsewhere assures us that "the seeds of infection were carried from the guard-ships into our squadrons; and that the mortality thence occasioned was greater than by all other diseases or means of death put together."

Howard gives us some cases of destruction of life among soldiers on a smaller scale. In his visit to the county jail, Chester Castle, he inspected some cells, one of which, when the door was shut, brought to his mind the Black Hole at Calcutta. An officer at Worcester told him that having sent a sergeant and two men for two deserters lodged here, three of them died a few days after they came to their quarters. And of the Savoy, in which military prisoners were confined, he reports thus in March, 1776: "I saw many sick and dying. The gaol was so

infected by them, that the distemper has been caught there by many since." Again, in May of the same year, he says: "Many of them sick of the gaol distemper in the rooms where I saw the sick and dying in March."

But this is not all. The prison lists, as given by Howard, often contain the significant entry, "impressed men." I find it in eleven instances. The number of such prisoners was 77.

Thus in every possible way was the jail-fever brought to bear on our army and navy. Our soldiers and sailors were taken to it, and it was, in turn, carried to them.

Having now shown you how the jail-distemper invaded our courts of law, spread among the population of our towns and villages, and infected our armies and fleets, I proceed to describe the places in which the disease was born and bred.

I must premise that in Howard's time the majority of prisoners were debtors. In 1779 there were 2076 debtors to 804 felons, &c., 909 petty offenders, and 526 prisoners in the hulks. In Wood Street Compter, from which I take my first illustration, there were, at that date, 38 debtors and 11 described as felons, &c. Of the debtors 6 were women. Well! five years before this date, this prison was in the state I am now to describe. There was a room in it known as "the common side," 12 feet high, 33 feet long, and 15 feet wide, within the bare walls. The beds were piled one above another "in little separate cabins," the access to the uppermost tier being by a ladder. The room had a door, and a chimney, and near the door two windows, usually kept shut, and looking into a dark entrance. The victuals were dressed by a large fire in this room, which is described as "capable of holding above 40 prisoners." If we take the number at 40, and make no deduction for the beds, the cubic space per prisoner would be less than 150 feet. Well might Lettsom say that if the projector of this apartment had exerted his utmost ability

he "could not have planned a place of the same dimensions more effectually calculated to destroy his fellow-creatures." The City of London had so neglected its duty towards these poor creatures, that when they fell ill not even an apothecary was engaged to attend them. The Governors of the General Dispensary supplied this want; and during the year 1773, Lettsom attended eight patients with the jail-fever, of whom two died: one of the two being the man Russel whose clothes infected his family. When Howard visited this place, the keeper told him that "in the beginning of the year 1773 his prisoners were sickly, and 11 died."

That this Wood Street Compter was no exceptional case, you will infer from the extracts I have made from the Report of a Parliamentary Committee on the State of the King's Bench, presented to the House in this same year 1773; you will find the Report in the Commons Journals, 13 Geo. III., p. 123. It states among other things that on account of the number of prisoners being always greatly in excess of the number of rooms, the marshal had permitted many to lie in the chapel, in the tap-room, on the staircases and benches, and other improper places, by which means they contract disorders, which often prove fatal, not only to themselves, but to the prisoners in general; that there are no separate apartments for sick prisoners, no place for the confinement of the riotous, nor any stronghold for prisoners committed for capital offences; that the walls of the prison are so low and thin that prisoners often escape over and through them; and "that prisoners have been known to break through in less than half an hour." The petition of Benjamin Thomas states that the prisoners took the rooms by seniority, and had to wait many months for them, during which time they were "obliged to contract with some old indigent prisoner for a lodging at an exorbitant price."

These two examples will give you an idea of the state of prisons in London about the year 1774. I will now give one or two illustrations of the condition of prisons and bridewells in country places from the pen of Howard.

1. *Dartford County Bridewell*.—"No chimneys; offensive sewers; and the rooms dirty; no water, no straw; no court." "The keeper told me, they had about two years ago a bad fever, which himself and family and every fresh prisoner caught. Two died of it."

2. *Cambridge Town Bridewell*.—"In the spring of 1779, seventeen women were confined in the daytime, and some of them at night, in a room 19 feet square, which has no fire-place or sewer. This made it extremely offensive, and occasioned a fever or sickness among them which alarmed the Vice-Chancellor, who ordered all of them to be discharged. Two or three died within a few days."

3. *Marlborough County Bridewell*.—All the rooms are on the ground-floor; and, by a sewer within doors, are made very offensive, "especially the men's night-room, in which, when I was there first, I saw one dying on the floor of gaol-fever. The keeper told me that, just before, one had died there, and another soon after his discharge."

4. *County Gaol, Launceston*.—"The prison is a room or passage $23\frac{1}{2}$ ft. by $7\frac{1}{2}$ ft., with only one window, 2 ft. by $1\frac{1}{2}$ ft., and three dungeons or cages on the side opposite the window; these are about $6\frac{1}{2}$ ft. deep; one 9 ft. long, one about 8 ft., one not 5 ft.—this last for women. They are all very offensive; no chimney, no water, no sewers, damp earth floors, no infirmary, the court not secure, and prisoners seldom permitted to go out to it. Indeed the whole prison is out of repair, and yet the gaoler lives distant. I once found the prisoners chained two or three together. Their provision was put down to them through a hole (9 in. by 8 in.) in the floor of the room above (used as a chapel), and those who served

them there, often caught the gaol fever. At my first visit, I found the keeper, his assistant, and all the prisoners but one, sick of it; and heard that, a few years before, many prisoners had died of it, and the keeper and his wife, in one night." This is just the sort of place in which the infection of the Black Assize of 1742, described by Huxham, is likely to have originated.

And now, having illustrated the state of our prisons, in town and country, I will give you a condensed account of it, taken from the materials so laboriously and conscientiously collected by Howard, and chiefly in his own words.

"Many prisons," he says, "are scantily supplied, and some almost totally unprovided with the necessities of life." "Many prisons have no WATER;" "in some places, where there is water, prisoners are always locked up within doors, and have no more than the keeper or his servants think fit to bring them; in one place they were limited to three pints a day each—a scanty provision for drink and cleanliness!" "And as to AIR . . . given us by Providence quite *gratis* . . . methods are contrived to rob prisoners of this *genuine cordial of life*, as Dr. Hales very properly calls it." So foul was the air of the jails, that Howard's clothes, in his *first* journeys, were so offensive that he could not close the windows of his post-chaise, and was, therefore, often obliged to travel on horseback. And he tells us that the leaves of his memorandum-book were often so tainted, that he could not use it till after spreading it an hour or two before the fire; and that even the phial of vinegar, which he thought an antidote, after using it in a few prisons, would become "intolerably disagreeable." He adds, "many gaolers made excuses, and did not go with me into the felons' wards." The supply of LIGHT was not more liberal than that of air and water—a circumstance which Howard

accounts for by "the *window-tax* which the gaolers have to pay; this tempts them to stop the windows, and stifle their prisoners."

Thus scantily supplied with water, air, and light, the prisoners literally *rotted* in "close rooms, cells, and subterranean dungeons," of which this is no exaggerated description:—"In some of these caverns, the floor is very damp; in others, there is sometimes an inch or two of water; and the straw, or bedding, is laid on such floors, seldom on barrack bedsteads. Where prisoners are not kept in underground cells, they are often confined to their rooms, because there is no court belonging to the prison." "In many gaols, and in most bridewells, there is no allowance of bedding or straw for prisoners to sleep on; and if by any means they get a little, it is not changed for months together, so that it is almost worn to dust. Some lie upon rags, others upon the bare floors. When I have complained of this to the keepers, their justification has been, "the county allows no straw; the prisoners have none but at my cost." "Some gaols have no SEWERS" (a term used to designate conveniences for the reception and discharge of offensive matters), "and in those that have, if they be not properly attended to, they are, even to a visitant, offensive beyond description."

Then as to food:—It may be said, with truth, that most prisoners were half-starved; and Howard tells us that in above half the *county jails*, the "debtors have no bread, although it is granted to the highwayman, the housebreaker, and the murderer; and medical assistance, which is provided for the latter, is withheld from the former." But though wholesome food and necessary medicine were withheld from the poor debtor, he might have as much spirituous liquor as he could contrive to earn or beg. And it was a well-known fact that, in most

prisons, charitable gifts were expended in this way ; while there is good evidence that, in some, the personal doles of the visitors, who were allowed to see the debtors at certain hours on certain days, were intercepted by men and women introduced from without to personate them ; and, if the begging was done on the premises by a box for contributions, the few pence collected were distributed among those only who had qualified themselves after some such fashion as that in force at Whitechapel prison for debtors. The qualification was an entrance fee to the jailer of 2s. 6d., and a treat to the prisoners of half a gallon of beer. So that, in those evil days, the gifts intended for the poor fell into the hands of the profligate, and money which should have relieved distress, found its way to the prison bar. This cruel farce performed in those times within prison walls, is, in our days, exhibited in the open street. The mendicant-thief intercepts the charity intended for the poor, and spends it in the gin-shop.

This repulsive picture of prisons and prison-life a century ago, admits still of some heightening touches. The prisoners, like Goldsmith's "Vicar of Wakefield," were allowed to have their families about them ; for Howard tells us, that "debtors *crowd* the gaols (especially those in London) with their *wives* and *children*. There are often, by this means, ten or twelve people in a middle-sized room ; increasing the danger of infection, and corrupting the morals of the children." Elsewhere, Howard complains of "the confining all sorts of prisoners together, debtors and felons, men and women ; the young beginner and the old offender ;" and, again, of "the number of men in the same room, and of lewd women, admitted under the name of wives ;" and of "lunatics at large in some prisons, disturbing and terrifying the other prisoners."

All these evils and abuses were carried to an extreme in jails that were *private property*, the keepers being protected by the proprietors, and less subject to the control of the magistrates. Now it is an eminently curious and instructive fact that some of the worst conditioned jails were the property of noblemen and Church dignitaries. Among the noble, reverend, and right reverend proprietors, we find Lords Salisbury, Exeter, Arundel, and Derby; the Marquis of Carnarvon; the Earl of Cholmondeley; the Dukes of Portland, Devonshire, Norfolk, and Leeds; the Bishops of Salisbury, Ely, and Durham; the Dean and Chapter of Westminster; and Christ Church College, Oxford. I subjoin three sketches of these private jails.

One of them, Howard tells us, "was quite out of repair and unsafe; and the proprietor, not choosing to repair it, the gaoler, to confine his prisoners, took a method that, to all who saw it, was really shocking."

Respecting the second of these jails Howard is more explicit; for he says that some years before that, a prisoner was tormented with thumbscrews; and that one of the grand jury (Howard's informant) remonstrated with the proprietor, but in vain.

My third illustration is given in greater detail. The prison of Ely was the property of the Bishop, Lord of the Franchise of the Isle of Ely. "It was in part rebuilt by the late bishop, about fourteen years ago; upon complaint of the cruel method which, for want of a safe gaol, the keeper took to secure his prisoners. This was by chaining them down on their backs upon a floor, across which were several iron bars, with an iron collar with spikes about their necks, and a heavy iron bar over their legs. An excellent magistrate, James Collyer, Esq., presented an account of the case, accompanied with a drawing, to the King, with which his Majesty was

much affected, and gave immediate orders for a proper inquiry and redress."

I will give you one more illustration of the same class, partly to show that the titled owners of these squalid properties, or those who acted for them, demanded a very handsome rent, and partly for the sake of the complete picture it affords of the consequences, inside and outside the prison, of the then system of imprisonment for debt. The prison in question is Chesterfield jail, the property of the Duke of Portland. It consists of "one room with a cellar under it, and the gaoler pays for it 18*l.* 12*s.* a year. The cellar has not been cleaned for many months, nor the prison door opened for several weeks. The prisoners occasionally descend to the cellar through a hole in the floor. There is no allowance, no straw, no firing, and water is put in at the window at the price of a half-penny the three gallons." Howard finds four prisoners here, who tell him that they are half starved, and one of them says that he has not eaten a morsel the whole day, though it is afternoon. Their meagre, sickly countenances confirm what they say. All have wives, and their families amount to thirteen children, cast on their respective parishes. Two had their groats (the legal allowance) from their creditors, and these relieved the other two.

Such being the places in which the jail-distemper was bred, it will be interesting to know in how many of them it was either witnessed or heard of by Howard, when he inspected our prisons in the few years following 1774. By marking those prisons, which he describes with some degree of detail, and noting in which of them he saw the jail-distemper, and in which he heard of its having recently prevailed, I find that out of 105 prisons he witnessed it in 6, and heard of it in 21. So that, putting the two figures together, we may reasonably infer that the disease haunted one-fourth at least of our jails. That

destructive diseases, and probably the jail-distemper, prevailed in prisons under direct Government control will be inferred from what Howard says about the hulks on the Thames. It resulted, he says, from a public inquiry, that from August, 1776, to March 26, 1778, out of 632 prisoners 176 had died. This is much more than 1 in 4.

I stated at the beginning of this lecture that the jail-distemper was believed to be peculiar to the prisons of England, and for this statement I had the authority of John Howard, who arrived at that conclusion after visiting the clean prisons of Holland, and the less clean, or eminently dirty and offensive prisons of Germany, Italy, Switzerland, Austrian and French Flanders, and France; and receiving from Russia what he deemed trustworthy information. But Howard was deceived in respect of France, and possibly of some other countries by the misuse of terms. Speaking of the Grand Châtelet in Paris, Howard says that a contagious disease prevailed there which in France they call *le scorbut*, the *scurvy*. "This distemper was found to proceed from the prisons; and to spread in the Hôtel Dieu, whither prisoners that had it were removed. The cause of it was generally thought to be *want of cleanliness in prisons*, where several of those confined had worn their linen for many months, and infected the most healthy new-comers that were put in the room with them. Eight hundred were ill of it at once in the hospital of St. Louis, to which all that were sick of it in the Hôtel Dieu had been carried." In the Bicêtre, Howard found "an infirmary for the *scorbut*, a distemper very common and fatal among them. There were 63 patients, most of them ill of this disorder. They contract it in a year or two from their confinement, as they are never suffered to go out of their rooms. Many lose the use of their limbs by it. I saw several such miserable ob-

jects at St. Louis's Hospital, where they are often admitted at the expiration of their term at the Bicêtre.' This must have been a terrible addition to the horrors of French hospitals, such as Howard saw them, and Frenchmen themselves have described them. Speaking of St. Louis and L'Hôtel Dieu, Howard says that they were the worst hospitals he ever visited, "abominable, and a disgrace to Paris." He had frequently seen five or six in one bed, some of them dying. One shudders as one pictures to oneself the Hôtel Dieu with 3655 patients thus packed together!

The jail-distemper then was not in Howard's time peculiar to the prisons of England or of the United Kingdom. It certainly did prevail in France, and probably extensively; for Murchison finds notices of it as occurring in the prisons of Nantes, Auxerre, and Rheims, also in Strasbourg and at Posen, in times comparatively recent.

In place then of describing the jail-distemper as peculiar to English prisons, we must treat it henceforth as a disease prevailing in them to an unusual extent, and with extreme severity.

And now I proceed to ask what this jail-distemper was: to inquire whether it was always one and the same disease, or whether there may not have been more than one fatal malady passing under the same name.

The answer to these questions, as far as they relate to the jail-distemper of the last century, the disease with which Howard had to do, is very easy. It was evidently that *Typhus Fever* which our best authorities agree in attributing to crowds and overcrowding: to crowded prisons and workhouses, crowded hospitals, camps, barracks, and ships, crowded lodging-houses, crowded dwellings in town and country. Wherever men and children live for some time together in places small in proportion to their numbers,

with neglect of cleanliness and ventilation, surrounded by offensive effluvia, without proper exercise, and scantily supplied with food, they incur the risk of this disease, and become centres of infection to others; and it is easy to understand how several persons having led such a life for weeks and months together, wearing the same clothing day and night, should come to be saturated with poison, and should be able to infect healthy persons breathing the same close and tainted air for hours together, as happened in courts of law at our successive Black Assizes. On the other hand, it is equally easy to understand how a single person issuing from such an atmosphere with such a taint upon him should be in a condition to infect crowds of persons living in a state not far, if at all, removed from that which had made him what he had come to be. Hence the infection of towns and villages, and of armies and fleets by recruits and pressed men fresh from their sojourn in prison.

But if we assume, as we safely may, that the jail-distemper of Howard's day was the typhus fever of our own; is it equally sure that our prisons always produced this infection and no other? I think not. I deem it improbable that, in earlier as in later times, the many unwholesome influences to which prisoners were exposed—want of air, water, food and exercise, cold and damp, and offensive effluvia of every sort—blended, as they must have been, in every degree of intensity, in every possible combination and permutation—should have always given rise to one contagious malady, and to one only. This reasonable expectation is fully justified by a careful comparison of the two Black Assizes of Oxford and Exeter—the one held in 1577, the other in 1586, and both described by Holinshed. At *Oxford*, there was sudden seizure on the spot of men only, no spread of the disease, bloody flux, and death within forty hours without delirium. At *Exeter*,

no immediate effect, seizure after a few days, "contagion and infection," spread of the disease through the county, and no mention of speedy death, or of bloody flux. The Oxford outbreak may have been a malignant dysentery; that at Exeter, the typhus of our day.

I leave this curious question for more practical considerations, and for that eminently useful inquiry how did this jail-distemper—this prison-typhus of the eighteenth century—this physical expression of manifold prison neglect and mismanagement, cease and determine? Who is to have the credit of that great reform which brought about the destruction of the destroyer? Hundreds of charitable persons, in every part of England, had taken pity on the poor debtor, and had given or bequeathed money for his relief, knowing full well how miserable he was; and every now and then, some rich man, or the King himself, would buy some wretched family out of bondage; but no movement of reform came from them. There had been Black Assizes, with their terrible consequences; and the law had been smitten, over and over again, in the persons of its highest dignitaries: but neither did the lawyers originate any reform. Medical charities had sent skilled physicians to the prisons on their errands of mercy; but they had rested satisfied with the work of palliation. The fever spread into our towns and villages, but neither local authority nor central government interfered to protect the lives of our people. It scourged our armies and fleets; but no word of remonstrance was spoken by Horse Guards or Admiralty. In 1701, the Society for Promoting Christian Knowledge sent a committee to visit Newgate; they distributed money and tracts, and exposed the gross abuses and immoralities practised there; but there, as in other prisons, things went on as before. Again, in 1729, General Oglethorpe, and his Committee of the House of Commons, began a laborious inquiry into the state of the Fleet, the

Marshalsea, and the King's Bench, and the crimes and cruelties of the miscreants Bambridge and Acton. Reports were prepared and presented, these wretches were tried and acquitted, the horrors of these prison-houses were revealed to an indignant and disgusted public, their outraged feelings found expression in the verses of Thomson, and full justification in the lively pictures of Fielding, Smollett, and Goldsmith ; but still no reform. Even Oglethorpe, the benevolent and patriotic statesman, the indefatigable chairman of Committee, the brave soldier, the wise administrator, finds no better course open to him than. to gather some few debtors from the prisons, and with them and others in want of employment, to go forth and found the colony of Georgia. But the glory of reforming the whole system of imprisonment in England, missed by this kindred spirit and worthy forerunner, was reserved for nearly half a century, till, in a happy hour, John Howard was appointed sheriff of Bedford.

In the year 1774, Howard was 48 years old. He had lost his second wife nine years before. He was a spare man of singularly abstemious habits, far from vigorous or robust ; and there was nothing in his then state of health, or in the history of his ailing childhood and sickly youth, to detract from the merit of his toilsome travels, and constant exposure to infection. He was neither learned nor accomplished, hardly to be called well-educated ; but he managed his estates wisely and liberally, and had always the command of money. His matrimonial arrangements and projects gave evidence of a strong will and somewhat eccentric disposition. But he was quite as wise in these things as the judicious Hooker, or the devout John Wesley. It is easy to take exception to his management of his only child ; and an ingenious psychologist might maintain the thesis that what was singularity in the father ripened into madness in the son. He was of active habits

and humane disposition ; and as the one tempted him to travel, the other attracted him to scenes of distress. Thus, when he was thirty years old, in the year after the death of his first wife, he went to the scene of the great earthquake at Lisbon. On his return he was captured by a French privateer, and had his first painful experience of prison life. And then it was that he had his first opportunity of showing the sterling metal of which he was made ; for, being liberated on parole, he first made himself fully acquainted with the cruel treatment to which English captives were being subjected in the prisons of France, and then, armed with facts, addressed himself to the Commissioners of sick and wounded seamen, and not only “gained their attention and thanks,” but the redress of the wrongs our sailors were enduring. Thus early did John Howard show his sympathy with suffering, his love of truth, his devotion to duty : thus early did he display his unconscious originality, his patience in collecting facts, his perseverance in using them, his rare unselfish singleness of purpose.

The year of Howard’s captivity in France (May 13th, 1756), the Royal Society did itself the honour of electing him one of its Fellows ; and he must needs justify their choice, by presenting three papers, the first on the degree of cold observed at Cardington in the winter of 1763, the second on the heat of the waters of Bath, the third on the heat of the ground on Mount Vesuvius. At Cardington, we are told, that on the first setting in of frost, he would leave his bed at two o’clock in the morning, to note the state of the thermometer in his garden, at some distance from the house. In this simple trait of *Howard the Philosopher*, we see, by anticipation, the invincible perseverance, and abnegation of personal ease and comfort, of *Howard the Philanthropist*.

And now I am to speak of *John Howard as Landlord*. It was on his estate at Cardington, near Bedford, that

Howard made his thermometrical observations in 1756. To that estate, enlarged by purchase of an adjoining farm, he brought his second wife, in 1758; there he continued to reside till 1774; and there he set an example to the landlords of England, by pulling down and rebuilding every cottage that he owned or was able to purchase, erecting new ones; and, in a word, transforming the village from damp squalor to wholesome cheerfulness, from sickliness to healthiness, from barbarous neglect to civilized, judicious interference and supervision. Here, again, the work which duty prompted him to do, was done thoroughly and completely. It was, perhaps, our first considerable work of sanitary reform.

The seventeen years that elapsed between the date of Howard's personal experience of prison life, followed by his successful intercession with the Commissioners of sick and wounded seamen, and the event that brought him again into direct contact with the prisoner, were spent mostly at Cardington, or at his house in Old Broad Street; but he was absent now and then, as once (in 1767) when he gauged the temperature of the Bath waters, and once in Italy (in 1770), where he took the opportunity of ascertaining the heat of the soil of Vesuvius.

The event to which I refer, was the appointment of John Howard of Cardington to the office of *High Sheriff of the County of Bedford*. Now it was the duty of a high sheriff to inspect the prisons and bridewells; but this duty had been systematically neglected. But Howard was too careful a man not to ascertain what his duties were, and too conscientious not to perform them. And if any other motive were needed by such a man, there was his own bitter experience of his captivity in France, when he had been made to suffer the "extremity of thirst," and the pangs of hunger, and had lain six nights together upon straw; and his recollection of the cruel treatment that

had caused "many hundreds of our prisoners of war to perish, and 36 of them to be buried in a hole at Dinan on one day." There was, also, by way of encouragement, the happy consciousness of the reform he had brought about by the simple, though toilsome process of collecting the facts of the case, and placing them, in all simplicity and earnestness, before those who had the power of redressing the wrong.

Thus moved by that "fellow-feeling" which is apt to make men "wondrous kind," and encouraged by the memory of a great success, Howard was scarcely installed in office before he paid a visit to the prisons of the county town, beginning, as it is alleged, with the cell of John Bunyan. He found in the three prisons of Bedford, the county jail, the town jail, and the county bridewell, good illustrations of the then prevalent abuses, exaction of fees, and utter neglect of health. Of the first of these abuses, Howard says:—

"The circumstance which excited me to activity in their behalf, was the seeing some who, by the verdict of juries, were declared *not guilty*; some on whom the grand jury did not find such an appearance of guilt as subjected them to trial, and some whose prosecutors did not appear against them, after having been confined for months, dragged back to gaol, and locked up again till they should pay *sundry fees* to the gaoler, the clerk of assize, &c." To the second of these abuses, Howard's attention seems to have been drawn after he had already visited most of the county jails in England. Having seen in two or three of them some poor creatures whose aspect was "singularly deplorable," and being told that they had been brought from the *bridewells*, he set out on a new journey into the counties already visited, where he inspected, not only the bridewells, but the houses of correction, and the city and town jails. In these inspec-

tions he displayed such industry and perseverance, that in the year following his appointment as High Sheriff, he had brought together a mass of materials in illustration of the two grand abuses to which I have referred, of such value that, when presented to the House of Commons, they not only gave him a public vote of thanks, but, what was to him infinitely more gratifying, they, with rare promptitude, passed two Acts—the one for the relief of prisoners who should be acquitted, respecting their fees; the other for preserving the health of prisoners, and preventing the jail-distemper.

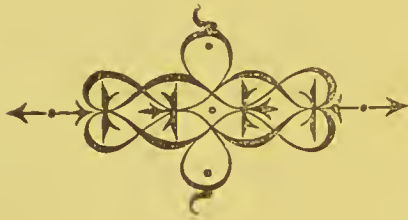
This Sanitary Act has many of the properties of sound legislation. It is concise and clear, prescribes what is to be done, insures the requisite publicity, constitutes a body of inspectors (the Justices of the Peace in quarter sessions assembled), and provides a summary punishment for the infringement of its own provisions. But Howard, having reason to believe that the provisions of the Act were being imperfectly and negligently carried out, set out on fresh inspections of English prisons in 1776 and 1779, and published the results, with an account of some foreign prisons and hospitals, in 1777 and 1780. You will infer that Howard had excellent reasons for what he did when I tell you that, according to a calculation I have made, the prisons in which the law had been strictly obeyed bore to those in which it had been imperfectly carried into effect the proportion of 15 to 130.

Nevertheless, the good work was begun, and, gathering strength as time went on, the sanitary measures which the Act of 1774 had inaugurated, gradually drove out the jail-distemper, and at length made the prisons of England to rank among the healthiest of the abodes of men. And when I say this, I speak not only of our County and Borough jails, which approach somewhat in the character of their inmates (always excepting

the poor debtors and pressed men) to the prisons of Howard's day, but emphatically of our great convict establishments where the extremes of every crime, cruel, revolting, and fraudulent, find representatives by the thousand.

I need not tell you that this great prison reform was wholly and solely due to the initiative of John Howard. I cannot tell you, for want of time, how much more he did for us in the seventeen years that elapsed between his appointment as Sheriff of Bedford, and his death in Russia; what voyages and journeys he made, what personal experiences he gained in the prisons, hospitals, and lazarettos of Europe, what moral courage he displayed in his encounters with fever and plague, what physical courage in his fights with pirates in the Mediterranean and thieves in the Crimea. Nor can I describe his last crowning act of self-sacrifice, by which he caught the fever he had escaped so long; and "died a martyr after living an apostle." Had time permitted, I should have wished to lay before you all the facts and incidents which supply the materials for a full estimate of his unique character. I should like to have defended it against his own modest depreciation of himself when he speaks of his work as "*a whim*" and himself as a "*plodder*," as well as against the strange misconceptions of those who could see in this man of genius (for such Edmund Burke took him to be) "a dull, solid, dreary man," a "beautiful" and "beatified philanthropist," a sentimental sort of being possessed of "a morbid sympathy with scoundrels." This is the language of indignant reaction against the miserable self-indulgence and misplaced sympathies of the age in which we are living; but it is wholly and ludicrously inapplicable to John Howard, who, if I read his character aright, had no sort of sympathy with crime or criminals, but a sense of justice, a submission to duty, a

moral and physical courage, an industry and perseverance, a truthfulness, simplicity, and modesty, which never before met in the same man, and probably will never meet again. He was emphatically one of those "Englishmen" to whom, if I may use the grand patriotic language of Milton, God, when he would work some great reformation, does, "as His manner is," first "reveal Himself." Once more I quote the words of Edmund Burke: "His plan was original, and it was as full of genius as it was of humanity. It was a voyage of discovery—a circumnavigation of Charity;" in a word, what I began this lecture by calling it, *a Romance of History*—a romance which shall to the end of time amuse and instruct, reprove and encourage, not those only who speak the language that Howard spoke, but those too, all the world over, who are able to appreciate the magnitude of the evils that he attacked, and the greatness of the victory which he won.



LECTURE VIII.

SMALL-POX.

IF I was right in calling my last lecture a Romance of History, I cannot be far wrong if I speak of this as the Romance of Science. For though Science has always been a wonder-worker, and often a dispenser of rare benefits to mankind, she never shone forth so brightly in both characters as when she put it into the mind of Edward Jenner to extract from the neglected gossip of the dairy the means of destroying the most loathsome and fatal pestilence that ever afflicted mankind. In so characterizing the small-pox I do not exaggerate. How loathsome it was, and what distressing consequences it entailed, in the shape of blindness, deafness, deformity, and impaired health, you all know. How it was the constant associate of the jail-fever in the prisons of England I have already told you. But I must vindicate by facts and figures its claim to rank as the most destructive of all our pestilences.

We have already had under review, in former lectures, the Black Death, the Sweating Sickness, and the Plague; the Scurvy, and the Jail-Distemper. Of these the sweating sickness may be set aside, as limited to England and a few nations of the Continent, and after five visitations during a short reign of some 66 years, ceasing from among us. Scurvy, too, from the very nature of its cause, and the jail-distemper, from its local character and partial

prevalence, cannot be brought into comparison with the small-pox. The plague alone, by the frequency of its recurrence and the extent of its ravages, may claim to be put into competition with it as a destroyer of life. Let us examine this claim.

I will first interrogate the London Bills of Mortality, and compare the deaths ascribed to small-pox and plague respectively in the years during which both diseases find a place in their columns. I am able to make this comparison for the 7 years, 1630 to 1636; and the 33 years, 1647 to 1679: in all 40 years. These years comprise the plague epidemics of 1636 and 1665; and yet while the total for plague is 87, 157, that for small-pox is no less than 34, 302. I cannot compare the deaths by plague and small-pox in any other group of years; but I may state that while the total mortality by the plague in 72 years, of which five were epidemic, was about 200,000, that by small-pox in 180 years did not fall far short of 300,000. The annual deaths from small-pox, within the limits of the London Bills, during the first 75 years of the eighteenth century, were largely in excess of 2000.

Small-pox, then, since the time that we began to make a record of deaths here in London, down to the year 1820, has destroyed about three lives for every two that the plague destroyed in the 72 years that it was entered on the Bills of Mortality. If we had had a death-register for the whole of England during the same period we should, most probably, have found the deaths from small-pox much more numerous than those from plague. And if we could extend our inquiry to the Continent of Europe, and from that to the whole habitable globe, we might, perhaps, find reason to endorse the estimate of Sir Gilbert Blane, who thought himself "greatly within the truth in asserting that small-pox has destroyed a hundred for every one that has perished by the plague." Dr. Black's esti-

mate of the annual mortality from small-pox in Europe alone, in times preceding vaccination, reaches the high figure of 494,000.

Among the reasons which may be assigned in favour of the superior mortality of small-pox, I may mention its universal prevalence in every part of the world, among all races of men, among all ranks of society, in both sexes, at all ages, in all seasons; its habit of making itself at home everywhere, not content, like the plague, with occasional visits; the large proportion of the population whom it attacks, and the many among them whom it kills. I speak, of course, of the natural small-pox; and I do not hesitate to characterize it as the most frightful and destructive pestilence that ever existed.

To form a vivid idea of its horrors, we must see it at work among a tribe of savages, as many travellers and missionaries have done. Here is what Alexander Mackenzie says of the disease as it attacked the North American Indians. It was as a fire consuming the dry grass of the field. The infection spread with a rapidity which no flight could escape, and with a fatal effect which nothing could resist. "It destroyed with its pestilential breath whole families and tribes." After picturing the scene presented by the dead and dying, and the putrid carcasses dragged out of the huts by the wolves, or mangled inside by the dogs feasting on the disfigured remains of their masters, he finishes by telling us that it was not "uncommon for the father of a family, whom the infection had not reached, to call them around him, to represent the cruel sufferings and horrid fate of their relations from the influence of some evil spirit who was preparing to extirpate their race, and to incite them to baffle death, with all its horrors, by their own poniards. At the same time if their hearts failed them in this necessary act, he was himself ready to perform the deed of mercy with his own

hand, as the last act of his affection, and instantly to follow them to the common place of rest and refuge from human evil."

To the same effect is the Rev. Mr. Cordiner's description of the ravages of the small-pox in Ceylon, where, according to a very moderate calculation, it carried off a sixth of the inhabitants. We are told that the disease inspired the people with such terror that husbands forsook their wives, and parents their children, leaving them only a little drink and food; that wild beasts attacked and destroyed the abandoned villages; and that not even the bones of the deserted sick were afterwards to be found.

I will give you one more case of the same class. A Dutch ship, with small-pox on board, put into the Cape of Good Hope, and the captain sent the foul linen ashore to be washed. The small-pox broke out among the Hottentots who washed the clothes, and killed most of them. It then spread up the country to such an extent that the native tribes at last drew a cordon round the infected places, and shot all who tried to pass beyond it. This fact, cited from Dr. Mead, affords a good illustration of the liability of the disease to be conveyed in articles of clothing.

That the small-pox was no respector of persons appears from the fact that the father, mother, wife, uncle, and two cousins of our William III. died of it, and that the king himself suffered from it severely and permanently. Maitland, too, writing in 1772, alludes to "the havoc made in great families, not many months since, by that mighty disease, which seemed then to go forth like a destroying angel, subduing all before it."

The origin of this destructive pestilence is involved in obscurity. It is said to have been mentioned in very ancient Chinese manuscripts, and in Brahmin records

3366 years old. But the best authorities point to the fact that a disease so contagious had not been imported from Asia into Europe prior to the sixth century, as throwing discredit upon these statements. It is true that some lynx-eyed authors, such as Hahn, have thought that they recognised the small-pox in the writings of Greek and Latin physicians; but Anglada, to whose able work on extinct maladies I refer you, proves, I think, that they were mistaken. We do not touch solid ground in this inquiry till nearly three-fourths of the sixth century had run out. Small-pox certainly attacked the Arabian army at the siege of Mecca in 569, and soon after reached Alexandria. The Saracens carried it with them in their warlike expeditions, and by the eighth century all Europe is supposed to have become infected. But Anglada, quoting Marius, Bishop of Avenches, and Gregory of Tours, proves that as early as 570 the disease had shown itself in France and Italy. At what time it reached England we do not know. It was once thought to have been brought back to us by the Crusaders in the thirteenth century; but Woodville found that distinct mention of it had already been made, as existing both here and on the Continent, prior to the ninth century.

But whatever the date of its arrival in England, small-pox, here as elsewhere, became a naturalized plague. We have notices of severe epidemics in 1174, 1365, 1440, 1556, 1564, and 1613; and from 1629 to 1831, it is entered on the London Bills of Mortality in larger or smaller numbers; in higher or lower ratios to the total deaths. In 1796 (the year of the introduction of vaccination) the deaths by small-pox exceeded 18 per cent. of the total deaths; and in 1772 they reached the high figure of 3992, or 15 per cent. of the deaths of that fatal year. The returns for the eighteenth century show that the mortality was subject to remarkable fluctuation. In 1702

it was as low as 16, in 1796 as high as 184, per 1000; and to this high ratio it rose from 50 the year previous, and fell to 30 the year after. If we call those years non-epidemic in which the death-rate fell below 100 per thousand, and those epidemic in which it rose above it, we have 66 of the one to 34 of the other. So that we may say that small-pox was epidemic once in three years. And if we term those severe epidemic years in which the mortality exceeded 150 in the thousand, we shall have five such, or one year in 20; and all of these occurred in the last half of the century; the most severe of all within four years of its close. The years and ratios were as follows:—1752, 173; 1757, 155; 1772, 154; 1781, 170; 1796, 184. If we take the years of the century in groups of 20, the first group exhibits the lowest rate of mortality, the fourth the highest; the figures for the five being 68, 78, 87, 99, 93. I shall give you a fair idea of its relative mortality if I say that in the last ten years of the century it was more than a hundred times as fatal as diarrhœa and its allied diseases; six times as fatal as apoplexy, palsy, and sudden death taken together; and seven times as fatal as the measles. So much for the prevalence of the disease, and the deaths it caused. Let us now inquire what was the rate of mortality among those it attacked, and what the proportion of the whole population whom, sooner or later, it destroyed.

The deaths among those attacked by the disease may be taken, perhaps, at a fifth for all ages, and a third for adults. In what is called its *confluent* form it killed a half; in its *discrete* form about 1 in 25; in the intermediate degree, 1 in 12. But there have been instances of a mortality exceeding the highest ratio, and falling short of the lowest. In my first lecture I gave one instance of 25 deaths in 44 seizures; and in my fifth I instanced a mortality of 13 in 19. The danger was always very

great at the extremes of life—in infancy and old age. The death-rate among the mixed class of persons received into hospital in all stages of the disease was one in three.

Of the mortality in middle life, we learn something from the experience of the army. Dr. Brocklesby tells us that about the middle of the century small-pox carried off about 1 in 4 of those whom it attacked in the natural way in encampments and winter quarters; and that only two out of nine soldiers escaped the disease. It follows, then, that out of 100 soldiers, only 22 would escape attack, and the same number (22 in every 100, or 22 in 88 of all attacked) would die from this cause. The mortality in the navy would, in all probability, be higher still, so that we shall probably be within the mark if we assume that when the small-pox was not in any way modified or restrained by inoculation or vaccination, one-fifth of all the men enlisted in our army and navy died of this disease. I need not add that, as a constant associate of the jail-fever, it passed from our prisons direct to our armies and fleets. How often this happened may be inferred from a fact stated by Sir Gilbert Blane, that, in 1800, the small-pox broke out 20 times in our Channel fleet alone.

The proportion of the whole population which small-pox destroyed may be inferred from the ratio which deaths by small-pox bore to those from all diseases in the eighteenth century. It was about 1 in 12. Jurin makes it 1 in 14 for the end of the seventeenth and beginning of the eighteenth century.

Of the numbers out of the whole community whom sooner or later it attacked, we know nothing certain; for while, on the one hand, we read that there was no age, however advanced, that the disease respected; on the other, we are told of whole families, or family groups, being small-

pox proof. Diemerbroeck mentions five octogenarians of his own family, and himself at 70, who had not had the disease; while Anglada, who quotes this fact, cites a fatal case at 70, and cases of recovery at 80 and 94 respectively; also a coincidence of an infant a day old, and a man of 80, at the same time under the care of the same physician.

I may here state, in reference to its worst secondary consequence, blindness, that there is ground for believing that from a half to two-thirds of our blind population formerly owed their sad privation to small-pox.

Some countenance is given to the higher estimates of mortality by a computation made by Dr. Haygarth that at Chester, in 1795, small-pox caused half the deaths of children under 10 years of age.

From a table founded by Dr. Gregory on the Registrar-General's returns for 1837-38, I calculate the deaths at different ages as follows:—Out of 1000 deaths, 752 took place under 5 years of age; 171 from 5 to 15; 54 from 15 to 30; 21 from 30 to 70; and 2 after 70. These figures do not show the ratio of deaths to the living at the several ages; but this is not needed for my present purpose, which is to illustrate the character of the disease by taking these facts into account in conjunction with what I have already stated respecting the occurrence of a small-pox epidemic every third year. If I read the figures aright, they point to a disease always specially greedy of the blood of children, but sometimes feasting upon them to repletion, and then waiting with cruel patience till the lapse of time had provided a fresh repast.

Against this loathsome pestilence, so widely diffused, so unsparing, so fatal, so cruel; blinding, deafening, and scarring many whom it spared, and sowing the seeds of future mischief in more; there arrayed themselves in course of time two champions—the one, *Inoculation*;

the other, *Vaccination*; the one introduced into England early in the eighteenth century; the other towards its close.

I shall first treat briefly of inoculation, then more at large of vaccination.

The discovery and first use of the method of Inoculation is involved in obscurity. "Some poor unlearned, but Heaven-taught, mortal," as Kirkpatrick has it; some Chinese, Hindoo, or Circassian first hit upon it. Our own earliest information about it came from two Italian physicians, Pylarini and Timoni, referring to the early dates 1701 and 1713. Pylarini thought that it was first practised in Greece and Thessaly, and Timoni that it was introduced into Constantinople, by the Circassians and Georgians, about 1670. There is no doubt that it had been practised by the Brahmins of Hindostan from a very remote period, and that the Chinese have long "sown" the small-pox by inserting a crust into the nose. And, strange to say, a method of inoculation known as *buying the small-pox* had been practised in parts of Wales for at least a century before the introduction of inoculation from Turkey. Be this as it may, it was from Constantinople that inoculation came to us. About the year 1717, Lady Mary Wortley Montague, wife of the English Ambassador to the Turk, had her son, six years old, inoculated there; and in April, 1722, her daughter, about the same age, here in England. This "charming and accomplished woman," in one of her playful letters, dated Adrianople, 1717, thus justifies the step she was then contemplating. "Every year thousands undergo this operation, and the French ambassador pleasantly says, that they take the small-pox here by way of diversion, as they take waters in other countries. There is no example of any one having died of it, and you may believe I am well satisfied of the safety of this experiment, since I intend to try it on my dear little

son." Then followed, under the sanction of the Royal Society, six condemned criminals; next five pauper children of St. James's; then the children of a few families of distinction; and to crown all, their Majesties, acting on the cautious advice of Sir Hans Sloane, had all the Royal children submitted to the operation. Mr. Maitland, surgeon to the embassy, was the operator in these cases, and in some ten others in the same year. Naturally enough, though the success of the plan in communicating a mild form of the disease was fully established by these early cases, the objection that the disease so imparted was the contagious small-pox, soon made itself felt. Indeed, Maitland himself had to deplore a very convincing and sad proof that it was so; for having inoculated the child of a Mr. Batt, in Hertfordshire, six of his servants, who had intercourse with the child, "were all seized at once with the natural disease, of which one died." The practice of inoculation, checked by this consideration, made its way very slowly; for Dr. Jurin, an industrious collector of facts, reports the total for 1722 to have been 182; and Kirkpatrick, adding together the cases brought together by Jurin and Scheuchzer for the first eight years after its introduction, obtains a total of only 897, of which 39 failed, and 17, at the very outside, died.

The rate of mortality incident to inoculation was certainly very favourable when compared to that of the natural small-pox. This I will show by comparisons relating to the same time and place. The deaths following inoculation in 1722, and rightly or wrongly ascribed to it, were at the rate of 1 in 91, at the very time that Dr. Nettleton reported from many towns in Yorkshire a mortality from the natural small-pox of 19 out of 100, or very nearly 1 in 5. The first eight years of the practice yield an average of 1 in 50 at the outside, against a mor-

tality from the natural disease that certainly did not fall short of 1 in 5. I add a few facts relating to the early periods:—In 1721-2, while the small-pox in New England was killing more than a seventh of those whom it attacked, inoculation proved fatal to only 1 in 51. In South Carolina, in 1738, while 1 in 5 died of natural small-pox, only 1 in 100 fell victims to inoculation. Some inoculators, dealing with a few cases, were unfortunate. Thus, out of a batch of 25 inoculated at Dublin, there were 3 deaths, being the high ratio of nearly one-eighth. But this is quite exceptional; and, as a set-off, I can cite from Kirkpatrick's work ratios after inoculation in England of 1 in 134, 186, 300, 370, 400, 425, 500, and 1000. But this is not all. Instances are cited by the same author of 134, 300, and even 1000 inoculated without a single death; and according to the statement quoted on the authority of Sir George Baker, at p. 17 of this work, the mortality might be reduced to something like 1 in 3000.

As the numbers just given relate to persons of every age, and of mixed ages, to private persons, and children and adults in public institutions, the demonstration of the general safety and slight risk of inoculation may be taken to be complete. Without taking up your time longer with this part of my subject, I will state, as the result of my own reading and reflection, that while, soon after the introduction of the practice the mortality might be as high as 1 in 50, it ultimately declined, as the result of growing experience, increasing care, and the progressive abandonment of the stifling system of treatment, to 1 in 500 at the most, while the natural small-pox continued even to comparatively recent times to claim some such ratio of victims as 1 in 4, 5, or 6. The most successful inoculator quoted by Kirkpatrick was a Serjeant Ranby. The Suttons also were noted for their success; but Dr.

Gregory gives much more credit to "diet and exposure to the open air," than to the antimonial and mercurial medicines which they extolled.

Before I proceed to vaccination, I must examine a question full of interest in the last century, and which has not yet lost its interest for us. I mean the real value of inoculation as a sanitary measure. If I have approximated to the truth in the figures submitted to you, we have, as it were, face to face, the natural small-pox with a mortality of, say, 1 in 5, and the inoculated disease with a mortality at the outset of 1 in 50, at length reduced to 1 in 500. So that if we suppose 1000 persons seized with the natural disease, something like 200 of them would die of it; but out of the same number submitted to inoculation, the deaths would not exceed 20 when the practice was in its infancy, and 2 when it had grown common, and prevailed largely. This saving of 180 lives in the 1000 on the least favourable supposition, and of 198 on the most favourable, will have to be set off against the deaths that may have taken place among the inoculated who, but for the operation, might never have caught the natural disease, added to the deaths occurring among those who caught the infection from the inoculated, but who would not have taken it had the small-pox been left to itself. Hence we may infer that, if the natural small-pox spared only some small fraction of the population, inoculation could not have added largely to the infection and consequent mortality; but if, on the other hand, the natural disease did, sooner or later, attack only a moderate proportion of the entire population, inoculation might, in the long run, cause more deaths indirectly than it saved directly. Now I believe that the first supposition is the one which experience supports: I think that the small-pox did not spare any considerable fraction of the people; but that, sooner or later, favourably or unfavourably, it

infected the greater part of them. I should, therefore, expect to find that a favourable impression was made on the total mortality from small-pox by the introduction and spread of inoculation. Such, however, was not the opinion of Sir Gilbert Blane. He alleged that inoculation had been mischievous, inasmuch as the proportion borne by deaths from small-pox to the total mortality had increased during the last century from 78 to 94 per 1000—figures which correspond very nearly to those I have already given. But Dr. Gregory, by dividing the last ninety years of the century into three periods of 29 each—1711 to 1740 (when there was no inoculation), 1741 to 1770 (when inoculation was coming into general use), and 1771 to 1800 (when inoculation was almost universal), obtained for the three periods the following deaths:—65,383; 63,308; 57,268, or an ultimate saving of 8115 lives! Reasonable objection may, I think, be taken to this division, on the ground that inoculation was certainly practised to some extent long prior to the year 1741; and also to the omission of a very necessary element in any such comparison—the number of the population. I shall steer clear of both these objections if I take the deaths by small-pox in three periods of ten years and compare them with the estimated population within the Bills of Mortality at or about the periods in question. I take, as fairly representing the mortality caused by small-pox, unmodified by inoculation, the decade ending 1719; as corresponding to the introduction of inoculation into partial use, that ending 1749; and, as corresponding to the large and general practice of it, the ten years ending 1799; and these are the ratios reduced to the common standard of a million inhabitants:—First decade, 31,416 deaths; second, 28,282; third, 22,863. There is, therefore, a reduction in the last decade as compared with the first of 8553 deaths; and so far a confirmation of the thesis

maintained by Dr. Gregory against Sir Gilbert Blane. If we take into account the salutary effect likely to have resulted from improved treatment and management of the sick, there will still probably remain some saving of life to place to the credit of inoculation.

Before I pass from Inoculation the palliative, to Vaccination the preventive, I must dwell for a short time on the small-pox as it showed itself in the last few years of the century when Jenner was busy with his great discovery. The disease then existed in two forms—natural small-pox, and small-pox modified by inoculation. What proportion the one bore to the other we do not know. But we learn from the London Bills that it was still a most destructive disease. Within their narrow limits it destroyed, in the last five years of the century, no less than 9827 lives; 3548 in the first year of the series, 2409 in the last. We must go back 15 years to find so fatal a year as the first; and, with that exception, nearly as many to find a match for the last. That the disease still retained its epidemic character, the fall from 3548 deaths in 1796 to 522 the following year sufficiently attests; and that, when not modified by inoculation, it was as fatal as ever we have abundant evidence. So that medical men and the public at large must have had, at the time to which I refer, stringent reasons for desiring and welcoming some better means of dealing with small-pox than inoculation had provided for them. They had had three quarters of a century of *palliation* with the evils always inherent in that mode of procedure; they were now to have conferred on them the far greater boon of *prevention* with all its contingent advantages.

The early history of vaccination belongs to the latter end of the 18th century, as that of inoculation did to the beginning of it. As the progress and development of Jenner's discovery belongs to the 19th century, it does not

come within the scope of these lectures; and I shall refer to it, therefore, only as far as may be necessary to prove its value.

The history of Vaccination is, to a degree quite unusual with great discoveries, that of the discoverer himself. I shall, therefore, treat Jenner in this lecture as I did Howard in my last. I shall blend the history of the discovery with the life of the man.

These are the leading facts of Jenner's history. He was born May 17, 1749; the son of a clergyman. He was apprenticed, at the usual age, to a surgeon at Sodbury, near Bristol. On the expiration of his articles, he came to London to finish his studies, and lived in the house of the celebrated John Hunter two years, with my grandfather as fellow-pupil. He then established himself in practice in his native town—Berkeley, in Gloucestershire; took the degree of M.D. at St. Andrews in 1792; made his first experiment in 1795; published the results of his experiments in 1798; received, in two Parliamentary grants, the sum of 30,000*l.*, in 1802 and 1807; lived to see the triumph of vaccination, and died in 1823, 74 years of age.

And now as to the discovery itself. Jenner was born, apprenticed, and settled in practice in a county in which the cow-pox prevailed. It does not occur in all the counties of England. Fortunately, during his apprenticeship, a young woman came into his master's surgery, and happening to speak about small-pox and its dangers, said, "I cannot take the disease, for I have had the cow-pox." This remark, coinciding as it did with the popular belief, made a strong impression on his mind. Other medical pupils and other medical men must have heard the same remark, and known of this popular belief; but Jenner alone stored it up as matter for thought and further inquiry. He spoke about it to John Hunter, and, on settling at Berkeley, often talked of it at his medical club, till his brethren

jocosely threatened to expel him as a bore. But Jenner was not to be deterred. He held to his opinions, and at length contrived to put them to the decisive test of experiment.

If any one is inclined to think lightly of this tenacity and perseverance, or to suppose that any medical man with the same opportunities would have done the same, I would quote to him a case in point. Inoculation was introduced into England by Lady Montague, after her son had been inoculated by Mr. Maitland, surgeon to the embassy, in March, 1717. Now that gentleman, by his own account, was fully convinced of the efficacy and safety of inoculation at that early date, and yet it is not till the summer of 1721 that we find him operating on the criminals in Newgate. Seeing that the experiments which Jenner had to make were already made for Maitland in Constantinople, and that he was quite satisfied by them, he certainly showed a want of lively interest and alacrity which contrasts strongly with Jenner's earnest perseverance, though the censure which Dr. Robert Williams passes upon him is certainly exaggerated, and not wholly deserved. Another consideration which enhances the merit of Jenner arises out of the fact just stated, that inoculation had been practised in parts of Wales for a long term of years, and yet no medical man had given serious attention to the immunity from small-pox which that local custom had notoriously conferred. Jenner's merit, then, consisted mainly in the intelligence with which he received, and the perseverance with which he followed up, the information he had obtained from the milkers in Gloucestershire. His was not a great discovery, in the sense of requiring great original powers of mind, or great advantages of education; it was great on account of the moral courage and undaunted perseverance which carried it to a successful issue; and great

beyond all other discoveries of its class, or indeed of any class, in the benefits conferred upon mankind. In a word, the discovery of vaccination is stamped by *moral* rather than by *intellectual* greatness, and this its moral character shines forth in every part of its history. For I need not tell you that in clinging to his first strong and just impressions, in bringing his convictions to the test of experiment, in promulgating and defending his discovery, he had to encounter grievous opposition, the compassionate incredulity of friends, the envious carping of rivals, the misrepresentations of enemies—nay, even the mistaken objections of good and pious men—in a word, to undergo the martyrdom which seems to have been decreed as the lot of those who confer on the world the boon of great discoveries. It redounds to the credit of Jenner that he bore these severe trials well; and that these annoyances had as little power to irritate him as had his ultimate success to impair the native modesty and unassuming worth of his character. Unspoiled by flattery, unchanged by success, he continued to the last the same kind, affectionate, simple, truthful character he had ever been; constant in his attachment to natural history, active in the discharge of all his duties as a citizen, and unremitting in his attention to the poor.

Let us now examine this great discovery, and look forward as far into this, our nineteenth century, as may be necessary to test and determine its value.

I assume that you know what vaccination is, that you understand it to be the introduction into the human body, by a puncture or punctures in the skin, of that same matter which forms on the udder and teats of the milch cow, and is transferred to the hands of the milkers; that its insertion gives rise only to local effects, with very slight constitutional disturbance; that it is not communicable otherwise than by direct contact; that

it is a preventive of the natural small-pox, in the great majority of cases; and that when it does not prevent an attack, it mitigates its severity more certainly than a previous attack of small-pox itself does. It is interesting, though comparatively unimportant, to state that the local disease thus imparted to the human subject is but the small-pox itself, modified by passing through the body of the cow, and further that the same human malady becomes in the horse the horse-pox, or variolous grease. All this has been ascertained by experiments suggested by observation.

Now vaccination, as we practise it, and as Jenner himself performed it, owes its origin to a series of simple inferences from the confident statement made to Jenner and others by the milkers—that having contracted cow-pox from the cow, they were thereby rendered proof against the natural small-pox—the first inference being that the infectious matter would take effect as well when inserted by the point of a lancet as when rubbed into the skin of the hand; and the second that, if this insertion were followed by distinct local effects involving the production of lymph, that lymph would itself give rise to the same local consequences, and so on through an indefinite series of insertions. In a word, it was assumed, and happily demonstrated, that just as small-pox had been made to pass from person to person by the inoculation of the matter of a small-pox vesicle or pustule, so cow-pox might be communicated from person to person by the same mode of procedure.

I will now apply to this preventive of small-pox that test of figures which I brought to bear on the palliative of inoculation.

Vaccination, which may be said to have been introduced in 1796, could have had little effect in limiting the deaths from small-pox in the remaining years of the century; for in

1801 the total number of the vaccinated is believed not to have exceeded 6000. We must, therefore, allow a few years of the nineteenth century to elapse before we select a decade of years for comparison with the three which I chose as tests of inoculation in the eighteenth century. Let us take the ten years ending 1819, when vaccination had been brought into general use, and also the ten years, ending 1849, when inoculation may be said to have been superseded by vaccination. Well, the deaths by small-pox in London, which, in the ten years ending 1799 were 22,863 to the million of inhabitants, were reduced to 8045 in the million in the decade ending 1819, and to 4798 in that ending 1849. So that, while inoculation could claim, at the outside, to have reduced the mortality from small-pox in eighty years by about 8500 deaths in somewhat less than 31,500, vaccination might boast of having lowered the death-rate from nearly 23,000 to little more than 8000 in twenty years, and to considerably less than 5000 in 30 years more; or (to bring these figures together) from 22,863 in the decade that closed the eighteenth century, to 4798 in the short space of fifty years. But this is not all; for if I reduce my figures to the scale of one year instead of ten, still retaining the standard of one million of inhabitants, I am able to show a further decline of mortality coincident with a further extension of vaccination.

Let me premise that, in the history of vaccination in the present century, there are three periods to be noted—one ending 1840, prior to the enactment of any vaccination laws; one ending 1853, during which vaccination was gratuitously provided; and one in which we are now living, that may be called the era of compulsory vaccination. Now, I will retain my own decades, with the understanding that the one ending 1849 fairly represents the gratuitous period, and add the decade ending with 1860 as embracing seven years of

the period of compulsion. I take my last figures from Dr. Seaton's excellent Handbook of Vaccination. The figures for the eighteenth century which show the possible influence of inoculation are 3141, 2828, and 2286; and for the nineteenth century, which display the effect of vaccination, 805, 480, 272. A fall from 3141 per million per annum to 2286, represents, therefore, the reduction of mortality from the reign of small-pox uncontrolled, to the rule of small-pox modified by inoculation; and from 2286 to 272 the superiority of vaccination with State patronage and aid to inoculation without it. Or, if we employ a method of comparison I have so often resorted to in these Lectures,—I mean the ratio of deaths by small-pox to deaths from all causes—I find a progressive fall, with a single trifling interruption, from a maximum mortality by the natural small-pox of 108 in the thousand in the ten years ending 1770, to 11 in the thousand in the ten years ending 1860. I will place the figures before you for each decade. They are 108, 98, 87, 88, for the four decades of the eighteenth century; 64, 42, 32, 23, 16, 11, for the six decades of the nineteenth. These are remarkable figures; but they are not such as would have satisfied the aspirations of Jenner, nor should they content us. We ought not to count our work done while anything remains to be accomplished.

It was the cherished opinion of Jenner himself that vaccination is competent to the entire extinction, or, as we should now term it, *stamping out*, of the small-pox; and this opinion of his was shown to be no idle dream by facts which came to his own knowledge. A manuscript of his, published by Baron in his "Life of Jenner," contains this striking history: "From the year 1762 to 1792, the number that died of small-pox in the Danish dominions amounted to 9728. About the year 1802, vaccination was first introduced, and the practice became general, but

not universal; however, 58 persons only died of the small-pox to the year 1810. Vaccination, by command of the King, was now universally adopted, and small-pox inoculation prohibited, and from the year 1810 to the year 1819, not a single case of small-pox has occurred.' Again, "From Bombay, I learn the small-pox is there completely subdued, not a single case having occurred for the last two years." These facts, amply confirmed as they are by others of the same order industriously brought together by Sir Gilbert Blane, are exactly such as we could wish to see gilding the sunset of Jenner's well-spent life, food for his joyful and pious reveries, warrants of the gratitude he felt towards God for the good he had made him the instrument of conveying to his fellow-creatures. If, when he was on the point of proclaiming the preventive efficacy of vaccination, "the situation in which he stood (to use the words of his biographer) has seldom had a parallel in the history of our race," what must have been his feelings, as, armed with such facts as these, he looked forward with confidence to the time when "this most loathsome and afflicting of all the scourges of humanity" would be banished, not from his own England only, but from the whole habitable world?

What else remains of this Romance of Science belongs to the nineteenth century, with which we are not at present concerned. And now I approach the end of these Lectures, and will take my stand for a few minutes at the point of time that separates the eighteenth from the nineteenth century, casting a glance back to the past, and forward to the future.

The history of the remote past teaches us, I think, that whatever may be the case in warmer climates, it is true in these colder and temperate ones, that the nearer men are to nature the farther they are from health. In those days when the chief occupation of men was the care of

cattle and the culture of a few fruits, and when manufacturing industry was limited to the production of coarse clothing, frail and combustible habitations, and implements for warfare and the chase, they were the prey of frequent famines and pestilences, and subject to a rate of mortality of which, in these days, we have happily no experience. How much the contests of rival chiefs, the insecurity of life and property, the condition of serfdom, the absence of roads, the huge unreclaimed tracts of forest and marsh, must have weakened production and strengthened disease, it is not difficult to imagine.

Passing on to the time when men began to collect in cities, and to fortify themselves by walls and moats against lawless violence, when the culture of grain took the place, to some extent, of the care of cattle, we still find both town and country, the dwellings and the habits of the people, hostile to health, favourable to the production of disease at home and the reception of pestilence from abroad.

And even when we arrive at times that may claim to be called civilized; when we had attained to a central and stable government, had long thrown off the incubus of serfdom, had established flourishing manufactures and were carrying on an extensive commerce, had largely improved our agriculture, and taken our first lessons in horticulture, our cities and houses were so squalid and filthy that the plague found itself quite at home in them.

Then, little by little, as civilization advanced, the twin virtues of cleanliness and temperance asserted their rights. Men bathed and washed oftener, submitted to frequent changes of linen, and admitted tea, coffee, and chocolate into competition with beer, wine, and spirits. They came by degrees to live in better houses and cleaner towns. We saw the last of the plague, and were in the right way to rid ourselves of some, at least, of our home-bred pestilences.

But I need not remind you how much remained to be accomplished, even as late as the last quarter of the eighteenth century. I have entered so fully into this subject, and done, as I venture to think, such ample justice to it, that I must content myself now with reiterating what I said in my first lecture of the immense importance, in a hygienic point of view, of that remarkable epoch.

One question, indeed, the sanitary triumphs of that epoch do suggest, for the answer to which we must look forward into the times of which men now living have had experience. Does the history of the last 70 years warrant us in looking forward to fresh sanitary discoveries and triumphs; to a healthier, and therefore, happier future? I answer this question, without hesitation, in the affirmative. These are the grounds of my confidence.

In the first place, I am encouraged by the fact that Jenner's singular discovery has proved no idle dream of philosophy, but a great truth, fruitful in results, and in a fair way to realize the most sanguine expectations of its author.

In the second place, I attach great importance to the fact that already this century can boast one capital hygienic discovery,—with which the name of Dr. Snow is so honourably connected—the discovery that cholera, to which we may confidently add typhoid fever, may pass from person to person, from house to house, from district to district, in drinking water. I recognise, too, as very important that other hygienic discovery due to the independent researches of Drs. Bowditch and Buchanan—that there is a decided relation of cause and effect between dampness of soil and consumption. These two truths must have a grand effect on the future of water-supply and drainage, on the cleansing of our towns, and the application of their refuse, solid and liquid, to our least fertile soils.

In the third place, it is impossible not to feel the great importance which attaches to the happy results that have

followed in so many towns, on well devised measures of drainage and water supply.

In the fourth place, I draw many inferences highly favourable to our future progress in *hygiène* from the modern history of medicine. We have made immense progress in the knowledge of minute structures, healthy and diseased, in the instruments by which we assist our senses, in our diagnosis and recognition of diseases, and in their treatment also. We have attained to a wonderful command over the function of sensation, as shown by our painless operations and local *anæsthetics*. We have made, and are still making, immense progress towards what I may call the natural treatment of disease, as distinguished from those artificial procedures of which I have given you some instances in these Lectures. We are far beyond the point at which 400 scorbutic patients could be sacrificed to a wild mercurial theory, or the lancet be ruthlessly employed to slay, not the fever, but the patient.

In the fifth place, it is difficult to exaggerate the value of the mortuary returns now obtained from every part of the United Kingdom, or of the special inquiries set on foot by the medical officer of the Privy Council.

And lastly, I augur well for the future from the change slowly, but surely, coming over the public mind. It is being taught, in many ways, that the Policy of Palliation, in which we have so long indulged, is eminently unfruitful, and positively mischievous. The time is evidently approaching when the Preventive Philanthropy (as I have ventured to call it) that guided the footsteps of Howard, will fill the hearts of the people, and the Policy of Prevention become the one rule of action of the Legislature.

Should these Lectures be found to have helped forward, in some slight degree, the advent of this better time, I shall feel amply repaid for the labour I have bestowed upon them.

LECTURE IX.

THE WAR OF THE FRENCH REVOLUTION.

THE terrible conflict which, but a short time since, was raging on the territory of our nearest continental neighbour, destroying one empire and building up another, and ending in the complete failure and collapse of a great military nation, has revived that interest in war and all that relates to it, which had been gradually dying out since 1815, in spite of the many warlike episodes, some anxious and even critical, in which England has borne a part in that period of fifty-eight years. The revived interest of which I speak centres in two points—armaments and men. With the first the physician has nothing to do, with the second much; for the excessive sickness and mortality that formerly attended every warlike operation by sea, and which still follow in the track of armies, have for him not only a direct interest but an indirect one, inasmuch as he recognises in them in an exaggerated form the operation of the same causes that so fatally afflict the civil population.

In the course of eight lectures given at King's College in the spring of 1870, and since published, I brought the Sanitary History of England down to the end of the eighteenth century; and I expressed a hope that I might be able, on some future occasion, to extend it into the nineteenth. The war between France and Germany, by reminding me of our long struggle with revolutionary and imperial France, has led me to select for separate treatment

the first fifteen years of the nineteenth century, taken in connexion with the last seven years of the eighteenth ; and I feel that if I can treat these twenty-two years of almost uninterrupted warfare, as I have already treated our earlier sanitary history, I may render some further service to that science of Hygiene to which I have so long been attached.

I am about, then, to do for war in its Sanitary aspects what I have already done for the Health-history of England, without special reference to the warlike conflicts, the civil strifes and foreign struggles which make up so considerable a part of our annals, and had so much to do with the introduction and spread of many a fatal pestilence.

The subject of war, in its relation to disease, forces itself on the notice of the English sanitary historian of the nineteenth century, as the first to be considered ; for war was the special business of England during by far the greater part of the first fifteen years of the century, as it was of the last seven of the century preceding—as it had been, to say the truth, of nearly the whole eighteenth century, from one end of it to the other.

I might, therefore, have taken up this topic of war in its Sanitary aspects at some earlier period of our history—say, in relation to the year 1713, when the treaty of Utrecht brought to a close the War of Succession, rendered famous by the victories of Marlborough ; or to those later wars that came to an end in 1748, 1763, or 1782.

But if any one war may claim to be chosen rather than another, as germane to a treatise on war in general, assuredly it is this of the great French Revolution ; for it lasted, with only short intermissions, no less than two-and-twenty years, testing and straining to the utmost the resources of England in men and money—in skill, cou-

rage, and endurance—crowned with many a glorious victory by land and sea, chequered with not many reverses, and but very few disasters. In this long period of nearly a quarter of a century, war presented itself in every possible aspect—many-sided—a thing of infinite variety. There were military and naval operations, and co-operations too, of every possible and conceivable kind. By land—stormings as of Badajos, and sieges as of St. Sebastian; obstinate, stolid soldiers' battles like that of Albuera; strategic trials of skill such as that which ended with the victory of Salamanca; great pitched battles, as at Waterloo; victorious onward movements, like that which led our troops to Paris; masterly retreats, as to the lines of Torres Vedras, or that earlier one to Corunna, crowned by victory, and hallowed by a hero's death, or that still earlier one to Ostend in the winter of 1795 when Wellington (then Lieutenant-Colonel Wellesley) did good service in the rear-guard; glorious campaigns, as of Egypt and the Peninsula; disastrous, destructive failures, as at Walcheren and New Orleans: but, on the whole, a grand balance of victories and successes, of which neither the France of Napoleon the Great nor the Germany of 1870 would need to be ashamed.

At sea, our own special element (though they speak foolishly who deny to the possessor of India, the country of a Marlborough and a Wellington, the name of a great military power)—at sea, there were rich West India Islands taken and retaken; treasure-ships captured, or destroyed; fleets—French, Dutch, Danish, and Russian—brought home in triumph; enemies' war-vessels beaten off by merchant-ships; skilful escapes from superior forces; adventurous boat attacks; strong fortresses, such as Malta, and valuable naval stations such as the Cape of Good Hope, added to our dominion; great sea-fights, critical and decisive, culminating in Trafalgar; and the

prestige we had lost in some single combats with America, fully restored by the chivalrous duel of the *Shannon* and *Chesapeake*.

From the very nature of the case every military enterprise, in which an insular people engage, must combine naval and military operations. It is not easy, therefore, to select, as deserving special notice, any one instance of successful co-operation. But the mind dwells with peculiar interest on Sir Sydney Smith's masterly defence of Acre; the first and not the least among the failures and disappointments of the first Napoleon.*

It is from among the warlike events of this great conflict of nearly a quarter of a century that I have set myself to extract what knowledge I can of war as a destroyer of human life; a subject which has assuredly lost none of its attractions through recent events. Nor, if we pass in review the half century and more that has elapsed since Waterloo, shall we find any reason for giving to war and all that belongs to it less attention than we had previously bestowed upon it. For that man must be strangely unreasonable and unteachable who cannot see that war is at least as natural as any of the pleasant vices which the nations practise and condemn; and that a sincere love of peace ought to be looked upon in the same light as cleanliness, industry, foresight, moderation, temperance, and health—the gradual growth of a state of things the reverse of natural, to which we are wont to give the names of progress and civilization. And if there is any one in England, or out of it, who thinks that the nations have already travelled so far on this artificial road that war is left behind them as a thing of the past,

* I allude to this passage of arms with special interest, as I had the pleasure of hearing from the lips of the gallant and adventurous sailor himself many details of the siege and defence of Acre, with which he was wont to entertain his visitors at Paris.

and that peace stretches before them like some rich fruitful plain, I ask him to look for a moment only at the events of the last half century, and at those which, so short a time ago, were passing almost under our own eyes.

In June, 1815, our twenty-two years' contest with France closed with the battles that culminated at Waterloo, in which some 50,000 of our troops (British or in English pay) had one-fifth of their number killed and wounded. That was the fact of the day known of all men, and brought home to many a bereaved and grieving household. But statist and statesmen, and the people at large in a dim sort of way, taking note of the struggle from one end of it to the other, knew that, on an average of all the years of war, more than 300,000 picked men, in the prime of life, had been continuously withdrawn from the productive labours of peace to serve in our fleets and armies; that at least 175,000 such men (say 8000 for every year of warfare) perished in excess of those who would have died had peace prevailed; that prisoners, increasing in number year by year till they reached a total of 10,000 or so, had languished, many dying, in unwholesome French dungeons, every effort to effect an exchange of prisoners having proved abortive; while other 10,000 free Englishmen were lawlessly detained on the resumption of the war after the peace of Amiens (perhaps as a partial counterpoise to the 70,000 Frenchmen and their allies at one time in our hands); and lastly, that, in addition to twenty-two years of war budgets, our national debt had been increased by 630 millions, or more than thirty millions for each of the twenty and a half years of actual warfare. Add to all this, the sudden paralysis of all the industries created and fostered by the war, and the necessary distress thence arising, and we have a state of things pleading most eloquently for peace.

And yet, the very next year, we bombard Algiers ; only eleven years later we take part in the battle of Navarino ; and after the lapse of seven years more, we are found interfering by force of arms, in a somewhat irregular way, in the domestic affairs of Portugal and Spain. In 1840 we bombard Acre, check the ambition of Mehemet Ali, and narrowly escape war with France. The year 1854 sees us fighting against Russia in the Crimea, and (not to weary you further with dates) we contrive to have diplomatic or colonial knots to cut with the sword, in Belgium, in Canada, at the Cape, in New Zealand, Affghanistan, and the Punjaub ; in Burmah, Scinde, China, Japan, and Abyssinia. And yet, all this time, we loudly professed, and sincerely felt, a love of peace. So eagerly, indeed, did we desire it, that we contrived to see in the Great Exhibition of 1851 a sure pledge of it. The whole nation was possessed by one benevolent enthusiasm ; and it was not till the Crimean War broke out, three years afterwards, that we were disenchanted.

Now that we are able to look back to that fond delusion, and the war with Russia that so soon, and so rudely, dispelled it, we are forced to confess that that divine *vox populi* (voice not of the ignorant masses, but of the cultivated leaders of opinion) was only to be compared to the strange fancy of the poor maniac gentleman who thought himself the Crystal Palace, and was consistently angry with the Government for threatening to remove it.

But I am aware that in what I have just said, I have omitted some considerations that could not fail to be taken into account by the men who were living in 1815. They knew, for instance, that in the ten years that had elapsed between 1801 and 1811, the population of England and Wales, in spite of its losses by the war, had

grown from little more than nine millions to little less than ten millions and a half, the increase exceeding a million and a quarter of people, or, one year with another, about 128,000 a year ; and that against the soldiers and sailors continuously withdrawn from peaceful labours, those whom the war destroyed, those others who languished in captivity, the war budgets, and the debt, there were certain obvious gains to be set off. Malta in the Mediterranean, and Heligoland in the North Sea, Ceylon and the Mauritius, British Guiana, and four West India Islands, were added to our possessions, and our Indian Empire was freed from French intrigue and interference. And these gains to us, be it recollected, represented losses to rivals more or less formidable.

To these our material gains we must add some of a wholly different order, hard to estimate, perhaps inestimable—many brilliant pages added to a history already glorious, the precedent of a most manly and persevering struggle crowned with signal success, a heritage of noble names and grand examples—tenacious patriotic Pitt, wise Marquis Wellesley, gentle and magnanimous Lord Howe, stern and resolute St. Vincent, ingenious and enterprising Dundonald, chivalrous Nelson, gallant and generous Sir Sydney Smith, incomparable Wellington, greatest among the great, if measured by the resources placed at his command, his administrative talent, his success in every form of warlike enterprise, the number of great strategists and generals whom he foiled and defeated (Junot, Victor, Massena, Ney, Marmont, Jourdain, Soult), without an equal, the superior no less than the conqueror of Napoleon, the apostle of humanity in war ! our Howard of the battle-field !

It is, of course, impossible even to guess at the value of the acquisitions, of which the foregoing are but the more conspicuous illustrations, in comparison with the

sacrifices, past, present, and future, by which they have been purchased ; but assess them at their highest conceivable value, and we must still feel that there remained to the men of 1815, and to all that have come after them, a balance of most weighty reasons against war and in favour of peace.

If now we turn from these events half a century and more old, to those that have so lately been occurring under our own eyes, we must confess, however reluctantly and sadly, that war is still to be classed among the things most natural to man. For not only were two great nations, to neither of which can we deny the name of civilization as men commonly construe the word, fiercely contending, the one for the European supremacy it had so long claimed, the other for security against aggressive interference ; but we ourselves, with the horrors of war fully realized, as we have never realized them before, proclaimed that we too were ready to fight if our interests or our honour were assailed. Nay, there was a section of our people that, partly touched with pity for France because she was unsuccessful and suffering, partly oblivious of the claims to sympathy of the kindred nation which shared with us the toils and risks of the short campaign of 1815, while thinking only of our Crimean comrade of 1854, and partly, perhaps, excited by the idea of a republic, so strangely fascinating to minds more remarkable for generosity than for sense, would have plunged England, without hesitation or remorse, into this sea of blood.

Seeing then that war, with all its bloody horrors, still retains its strange fascination ; that under one pretence or another, it remains one of man's most natural occupations ; that even in these later times, monarchical England, France, and Italy, in the Crimea, against despotic Russia ; republican America in the contest between North and

South ; Imperial Germany and France quite recently ; Versailles and the Commune of Paris, have all in turn fought for their several ideas, and to prevent aggression or dismemberment, or even remote contingent mischiefs, I feel that I am fully justified in assuming that war, in any or all of its more important aspects, is a subject which ought to occupy much of our attention, and is likely to repay any labour we may see fit to bestow upon it.

I have said that this great war with revolutionary and imperial France, embraced between its beginning and final close two-and-twenty years, occupying no less than twenty years and a half of the interval ; and it may be well that I should refresh your memories and mine by the shortest outline I am able to draw of its events by land and sea, in the order of their occurrence.

Our warlike operations commenced in 1793, with the occupation, defence, and loss of Toulon. A garrison composed of most heterogeneous materials—English, French royalists, and Spaniards—succumbed to a well-appointed French Army, and the genius of the first Napoleon ; Sir Sydney Smith doing excellent service in destroying and capturing French ships, and rescuing thousands of French royalists from the vengeance of the republic.

In 1794 St. Domingo and the French West India Islands, Corsica (with the strong fortresses of Bastia and Calvi), felt the force of English military and naval co-operation, and the navy, under Lord Howe, on the 1st of June, won its first great victory. On land, with Austria for ally, we began and ended our first campaign in Holland, gaining a victory at Cambray, and conducting ourselves most creditably under the command of the Duke of York, but forced at length to a retreat and evacuation of the country, in which retreat Lieutenant-

Colonel Wellesley did good service in the rear-guard. This year, be it observed, was noted for the severe frost which enabled a squadron of French cavalry to capture the Dutch fleet of fifty vessels.

1795 witnessed the services of our fleet under Lords Hotham and Bridport; the masterly manœuvres of Cornwallis, by which he eluded the enemy's fleet of twenty-nine sail, and, on a different element, rivalled the glory of the retreat of the 10,000 under Zenophon; the capture of the Cape of Good Hope; and the short and unsuccessful descent on Quiberon—the second of our failures in the Low Countries.

1796, the year of Napoleon's first Italian campaign, is remarkable chiefly for Abercrombie's successes in the West Indies.

1797, the year of the French failure in Wales, is memorable for our mutinies at Spithead and the Nore, and the great naval victories of St. Vincent and Camperdown.

In 1798 we suffered the Irish Rebellion, and won the great victory of the Nile.

In 1799 Colonel Wellesley commenced his brilliant career of military and administrative success in India, at the siege of Seringapatam; Nelson succoured Naples; Sir Sydney Smith baffled Napoleon at Acre; the Dutch fleet surrendered to Admiral Mitchell; and we made our third, not inglorious though unsuccessful, campaign in Holland.

The chief incidents of 1800 were the reduction of Malta, and Colonel Wellesley's defeat of Dhoondiah and capture of the Hill Forts.

1801 is memorable for Abercrombie's victory and death, and the expulsion of the French from Egypt; the battle of Copenhagen, under Parker and Nelson; the gallant action of Sir James Saumarez, off Cadiz; and the capture of Swedish and Danish West India Islands.

In 1802 (the year of the Treaty of Amiens), Boulogne was bombarded by Nelson.

1803 (the year of the renewal of the war), Major-General Wellesley won the great battle of Assaye, and broke the Mahratta power.

In 1804 we were again teased with an Irish Rebellion, and took some treasure-ships from Spain.

1805 was the year of Nelson's victory and death at Trafalgar, and of Sir Robert Calder's action off Cape Finisterre.

In 1806 Sir John Stuart fought and won the gallant battle of Maida; St. Domingo, Capri, the Cape, and Buenos Ayres were taken; and Sir Arthur Wellesley came back from India, ready to take part in the attack on Copenhagen in

1807, when also Duckworth forced the passage of the Dardanelles.

1808 is famous as the year in which Sir Arthur Wellesley landed in Portugal, won the battles of Roleia and Vimiera, and was stopped in his opening career of conquest by the Convention of Cintra.

In 1809 Sir Arthur resumes the command in Portugal, crosses the Douro, and wins the battle of Talavera, thus supplying a counterpoise to the loss of Sir John Moore at the victory of Corunna; while the disastrous campaign of Walcheren may be said to have found its counterpoise in Cochrane's gallant attack in the Basque Roads, Collingwood's success in the Bay of Rosas, and the capture of Bourbon and the Mauritius, of the Ionian Islands, Martinique, Cayenne, and St. Domingo.

In 1810 Wellington won the battle of Busaco, stopped and foiled Massena at the lines of Torres Vedras, leaving him no alternative but a disastrous retreat.

In 1811 the capture of Java was almost forgotten in presence of the gallant victories of Barrosa, Fuentes

d'Onoro, and Albuera, and the good service rendered by Sir Thomas Graham at Cadiz.

1812 was the year of the grand strategic victory of Salamanca, followed by the entry into Madrid, the sieges of Rodrigo and Badajos, and the less successful attempt at Burgos.

1813, the year of the action of the *Shannon* and *Chesapeake*, was the year also of the victory of Victoria and the storming of St. Sebastian, and of that series of gallant and successful encounters with Soult, the passage of the Bidassoa, and entry on the "*sacred territory*" of France, so quickly followed by the passage of the Nivelle and Nive.

Early in 1814 Wellington forced the passage of the Adour, delivered Bayonne and Bordeaux, won the battle of Orthez, and the lesser conflicts which led up to the great victory of Toulouse, by which France, and Paris itself, was laid open to our victorious arms.

1814, which witnessed this great recompense of a long struggle, witnessed also another and last attempt, under Sir Thomas Graham, to operate in Holland; and in America, the short campaign which had for its chief result the capture of Washington.

1815 opened with the disastrous repulse from New Orleans, and the slaughter of the veteran troops whom we missed so much at the crowning struggle of Waterloo.

In this brief survey of the events of the great war with France, I have made no mention of many a gallant naval fight between small squadrons or single ships, or of many a brave passage of arms between English and foreign soldiers, led by commanders whose fame has been overshadowed by the greater deeds of a Wellington or a Buonaparte. Some idea, however, may be formed of the activity of our warlike operations, from the fact that Mr. Hodge was able to register the results of no

less than 576 naval actions, which took place in the interval between 1793 and 1815, being at the rate of more than two a month for the whole period of twenty-two years. Some of these were cases of co-operation between our army and navy. Our military operations do not present such considerable figures, inasmuch as they were the continuous incidents of campaigns, of which some eighteen great battles and thirteen sieges were the prominent occurrences.

Out of the events of these twenty-two years of active warfare, I shall select, as affording special instruction in Sanitary Science, one great naval action, with the events that preceded and followed it (I mean Lord Howe's action of the 1st of June); the memorable campaigns of the Peninsula and of Egypt; and the disastrous expedition to Walcheren.

But that I may give to the subject of war in its sanitary aspects as much unity of character and logical consistency as it admits of, I must first inquire under what subordinate headings or divisions the subject may best be treated.

In the first place, it is very natural that we should bring to bear on war such light as our experience of mankind living in a state of peace can furnish. Then, I think we should proceed to seek out certain standards of comparison to which to refer the deaths by disease that war itself occasions, and those standards we shall find in our lists of killed and wounded. And as the French Revolutionary War, which I shall take throughout as my point of departure, involved both naval and military operations, and these have their peculiar features, the two should be treated separately, and then compared the one with the other.

Furnished with these standards of comparison, afforded by the killed and wounded, I shall proceed to use

them as measures of the losses inflicted by disease, distinguishing the Naval from the Military Service, and, as far as may be needful, one kind of warlike operation, by sea or land, from another. *Sickness* will then have to be treated as a cause of weakness and failure in military and naval operations, irrespective of the mortality which it occasions.

Having thus ascertained the leading facts relating to disease as caused by war, I shall next inquire what science and art have done in times past to save the lives of soldiers and sailors ; and I shall conclude by such general observations on England as a great naval and military power, as my inquiries may seem to warrant.

This being the plan of the course, I propose to arrange the lectures themselves, as follows :—In what remains of this lecture, I shall treat of the lessons applicable to war which our experience in peace supplies. In the two lectures that follow, I shall endeavour to ascertain the losses inflicted by disease when measured by those caused by actual fighting, in the Navy first, then in the Army ; and in my last lecture, I shall show what science and art have been able to do on behalf of the fighting man.

This is a large programme ; perhaps a rash one. I lay it before you, not without misgiving lest, in trying to carry it out, I should fall far short of my own wishes and your just expectations. But I derive some encouragement from the fact that an important part of my undertaking—that, namely, which relates to death by the sword and by sickness, in army and navy,—has been rendered comparatively easy by the condensed summaries of those who have preceded me in this kind of inquiry. I allude especially to two papers by my friend and fellow statist, Mr. Hodge, late President of the Institute of Actuaries, read at meetings of the Statistical Society in the years 1855 and 1856, and published in

the eighteenth and nineteenth volumes of the Society's Journal. Embodying, as they do, the results of laborious study and extensive reference to original records ; and presenting us with figures which are not mere summaries of facts, but truths clothed in numbers by an intelligent and accomplished actuary, I shall not only quote them with confidence, but, in consequence of the use I am able to make of them, shall be free to devote more time to those other inquiries which come within the scope of these lectures.

In reference to those other inquiries, I will only say at present, that I shall in these lectures, as in those given at King's College, always prefer a condensed abstract of some one narrative or treatise relating to some instructive discovery, combat, expedition, or campaign, to a less lively and graphic statement of the results obtained from the study and comparison of many documents bearing on the matters in question. To those who have read my first eight lectures, the accounts given of the Plague at Eyam, of the Devonshire Colic, of the Scurvy at Millbank, and of Anson's Expedition, will serve as illustrations of my meaning.*

And now, I address myself to my programme ; and, first in order, to the question, whether there are any experiences relating to health impaired, and life sacrificed during times of peace, which admit of application to the state of war ? In other words, is it probable, from what we know of peace and its dangers, that the state of warfare, divested of that part of it which consists in killing and wounding, would prove destructive to health and fatal to life ?

To answer this question aright, we must first form a clear conception of what war, in the very essence of it, is.

* "Public Health," Part I., Lecture IV., p. 93 ; Lecture I., p. 9 ; Lecture VI., p. 146, and p. 154.

Is it not the bringing one crowd of trained, disciplined, and armed men into fierce and angry collision with another crowd? If the war is waged by sea, the crowd is compressed into the narrow limits of a ship, and in great naval engagements, many such crowds on the one side contend with many on the other; if by land, the crowd occupies the wider area of an encampment or of a battle-field, or one crowd in the open assaults another crowd in the fortified town.

War by sea differs, indeed, from war by land in this, that, at sea, the men, though shut up in a smaller space, can carry with them everything they need—food and water, clothes and bedding, instruments, medicine, and sick diet—at the same time that the air they breathe is often absolutely free from all admixture of noxious matter, except such as may be bred by neglect within the ship itself. But the soldier on land (even under the best possible or conceivable organization) cannot always be supplied with a sufficiency of wholesome food, pure water, good and appropriate clothing and bedding, and proper shelter, with instruments, drugs, and sick diet; while he may be forced to encounter in his encampments, or on the field of battle, an air poisoned with the special exhalations of the land. With the sailor, again, exposure and fatigue are accidents of bad weather, and therefore occasional, while they are the almost inseparable incidents of the soldier's active warfare.

Other differences between war by sea and war by land, might be sought out and indicated; but, after all that can be said on this matter, this leading feature of both conditions remains unchanged:—War is the conflict and collision of crowds—of crowds drilled and disciplined, but still of crowds. But this is not all; for it is true of army and navy alike, but of the army in a special manner, that the very preparation for war necessitates and implies the

gathering of men together into crowds, that they may be drilled and disciplined. Accordingly, the barrack and the camp of exercise, even in times of peace, are scenes of overcrowding, and of the diseases which spring out of it.

We were taught this truth, to the surprise of many and the grief of all, by the Report on the "Sanitary Condition of the Army," published fifteen years ago, which some of you will recall to mind the better if I connect with it the name of Sidney Herbert. From it we learnt the two facts we have so often had occasion to place side by side, as cause and effect—the fact of overcrowding carried to an extreme, and the fact of a mortality among our Foot Guards (taken as the extreme case) nearly three times as large as that healthy standard, the then London Fire Brigade, exhibited ; and much more than twice as great as the rate prevailing among the City Police.*

It is these victims of overcrowding in time of peace, that even a rich and humane Government, like that of England, sends forth in war, to taste first the strange but unavoidable discomforts of the crowded transport, and then to face the stern realities of war itself, in the encampment, on the march, on the battle field, in the wearisome operations of attack or defence of fortified places ; to occupy villages, towns, houses, and buildings far worse supplied with sanitary appliances than those of their own country ; to contend with heat and cold, damp and drought, swamps and sandy deserts, and all the uncertainties, shortcomings, and blunders of a commissariat unequal, at the best, to furnish an adequate supply, always and everywhere, of food, clothing, shelter, and medicines ; and especially inadequate to the regular and constant supply, in all seasons, of fresh vegetables and meat.

* The Sanitary Condition of the British Army. Contributions to Sanitary Science, No. 2.

War therefore, and especially war on land, and war as we Englishmen had experience of it from 1793 to 1815, means the transport of a crowd of picked men, drilled and disciplined under circumstances unfavourable to health, to foreign and often distant lands, to be there exposed, always as a crowd, to strange climates, inclement seasons, trying weather, fatigues and privations, and defective supplies of food, clothing, and shelter, with actual fighting as an occasional, and perhaps very rare, diversion (for such the true soldier comes to consider it).

Now, our experience of the life of man in peace supplies us with instances, many and most instructive, of health undermined and life shortened by the simple fact of men being pent up in narrow spaces,—mustered into crowds. The word *overcrowding*, so common in Sanitary Reports and Treatises, is, in itself, an evidence of the frequency of the occurrence ; and, in these modern times, we have been able to throw our experience into the shape of a formula which expresses the direct relation between density of population as a cause, and disease as a consequence. And this density of population, this overcrowding of men, is proved to be favourable not to the production only, but to the reception and spread, of disease. I speak of *men*, as it is with them that we have now to do. But that which is true of men is true also of women and children—true even of animals. Overcrowding is fatal to all living beings.

Now, overcrowding may present itself in more than one aspect—as too many houses, huts, or tents, too many streets, or lanes, or courts, on a given area ; as too many persons in one house ; as too many people serving in a shop or warehouse, or toiling in a workroom or manufactory ; as too many sleepers in one dormitory ; as too many prisoners thrust into one place of detention ; as too many sick persons in one hospital, or ward of an

hospital: and in all these cases health and life are sacrificed.

These cases of overcrowding may be arranged in three distinct categories. First of all, we may group together, as forming one class, the cases of the shop, warehouse, workroom, factory, or dormitory, in which men are assembled in undue numbers, but, as a rule, exposed to no other unwholesome influences than those that emanate from their own bodies (the case of the dormitory), or from these in conjunction with the heat, dust, and chemical effluvia which are given out in the course of certain processes of manufacture. Then we have the case of the overcrowded dwelling, of which the inmates are exposed, not only to the poisonous products of respiration in sitting-rooms and bed-rooms, but also to such noxious effluvia as may arise out of a damp soil or defective drainage; and lastly, we have the case of the hospital, in which infectious forms of disease originate and spread among the subjects of accidental injuries or of operations.

Now, setting aside, as common to all these forms of overcrowding, the augmented liability to the reception and spread of all infectious maladies, we recognise, as proper to the first, pulmonary consumption; as belonging to the second; the several forms of continued fever; as pertaining to the third, erysipelas, pyæmia, malignant ulcer, and hospital gangrene.

In the densely peopled towns or villages, which soldiers are so often constrained to occupy, the soil beneath the houses and around them is often reeking with corruption, sodden with the damp products of decay; and these, not only become parents of fever and nurses of all sorts of pestilential maladies, by polluting the air, but also, as we now know, by poisoning the waters of wells or streams with the seeds of dysentery, cholera, and

typhoid fever, and probably of every form of contagious malady.

There is another and most fruitful cause of disease, of which we have had painful experiences in times of peace, and among classes of men devoted to peaceful pursuits. I mean food, insufficient in quantity, or wanting in the essential elements of all sound dietaries, fresh meat, vegetables, and fruits. Nor ought I to omit to mention one other cause of disease in soldiers and sailors on which our experience of men following peaceful avocations enables us to throw light. I mean that over-exertion to which all fighting men must be so often exposed in actual combat : soldiers in forced marches, retreats, and sieges ; sailors in stormy weather.

We have, therefore, at least four grand causes of disease with which we are familiar in times of peace, that are pretty sure to be brought into play in warfare—overcrowding, with its three leading varieties : impure water ; insufficient or improper food ; and over-work.

I will speak of these in turn, and illustrate them by cases in point, selecting, by preference, instances in which the sacrifice of life has been on the largest scale. And first, of *overcrowding*, beginning with that extreme form of it which consists in forcing into a narrow space a number of culprits, or captives. Such a case occurred in London in 1742, when the High Constable of Westminster committed twenty-eight persons to the Round House, St. Martin's, and Bird, the keeper, forced them into a place called the Hole, not more than six feet square, and scarce five feet ten inches high, with the windows close shut. In this narrow space four women were suffocated. The keeper was committed to Newgate, tried, condemned, and sentenced to death—a sentence commuted for transportation.*

* Gordon Smith's Principles of Forensic Medicine, p. 221.

Overcrowding carried to this point of suffocation is perhaps rare, even in war; but that degree of it which occurred at Calcutta in 1756 may be expected to happen as a common incident of warfare, and I therefore ask your attention to a brief abstract of the facts taken direct from the well-known narrative of Mr. Holwell.

One hundred and forty-six prisoners—soldiers, sailors, militia (black and white), officers and men, English, Dutch, and Portuguese, with many gentlemen of the civil service, and one native woman, all of whom were exhausted by continual watching and action, and many wounded, at eight o'clock on the evening of June 20th, 1756, were thrust into a space measuring about eighteen feet each way, having two windows, strongly barred with iron, on one of the four sides, and they were kept in this *Black Hole* till six o'clock the next morning. In other words, 146 adult human beings were shut up in a close sultry night, during ten hours, in a den affording to each inmate barely forty cubic feet of space. A few, who clung to the bars of the windows, or were pressed towards them, had some access to fresh air; while these, and some others, received frequent scanty supplies of water after the first hour had elapsed.

Of the 146 prisoners who were thrust in alive, 123 were dead when the prison doors were opened, and only twenty-three survived. Some had been smothered, some were pressed or trampled to death, some (wounded and unwounded) had died exhausted.

As the feelings and symptoms of men thus cruelly circumstanced must prove both interesting and instructive, I will give you the most condensed account I can of them, beginning with those shared by all, or by most; and then passing on to Holwell's account of his own sufferings.

After a few minutes, they all broke out into a most

profuse perspiration, followed by a raging and constantly increasing thirst, which, before the lapse of an hour, had grown intolerable, and was complicated with difficult breathing. The air of the place assumed a strong, pungent, ammoniacal odour. All who were not near the windows grew outrageous, and many delirious, and there was a general cry of *water, water!* This was passed through the windows in hats, but most of it was wasted, and it was thought to have done little good.

At the end of three hours and a half, the "much greater number" of the survivors were "in an outrageous delirium, and the others quite ungovernable, few retaining any calmness but the ranks next the windows." As the water seemed to increase their sufferings, the cry was now *air, air!* and for this they struggled violently but hopelessly.

Holwell lay for a long time insensible, and was therefore indebted to the survivors for the rest of his account. But he says that the particulars mentioned by some of them "were so excessively absurd and contradictory" as to convince him that "very few retained their senses;" or failed to lose them "soon after they came into the open air, by the fever they carried out with them."

On the second day after their release, the survivors were marched in fetters, under an intensely hot sun, and lodged under a small open verandah. Here all of them "broke out in boils all over their bodies," which Mr. Holwell characterized as a happy circumstance attending "every one who came out of the Black Hole." And here I take occasion to note the fact, that this is not the only case of boils resulting from poison introduced into, or generated by, the body. The hardships attending shipwreck, vaccination in rare instances, and the poison of the Oriental plague, in a majority of attacks, issue in this affection of the skin.

Holwell describes his own symptoms somewhat more in detail. He speaks in succession of the profuse perspiration, the raging and growing thirst, the difficult breathing, followed by exquisite pain in the chest and violent beating of the heart; of his despairing rush to the window, the quick relief afforded by the fresh air, his craving for water, and how he drank it without refreshment. Then we see him trying to drink his urine, but disgusted by its intense bitterness; yet finding the drops of perspiration sucked from his shirt-sleeves soft and pleasant as Bristol water. Next we see him sore tempted to use his penknife as an instrument of suicide, but summoning courage to resist and live on, and retaining sense and feeling enough to give his place at the window to a naval officer, and, by a last effort, struggle back into the den. Here he suffered no pain and little uneasiness, being conscious only of breathing 'as from a "bowl of hartshorn," and of passing gradually into a state of stupor. One more effort to improve his position and he falls insensible; and so remains till he is sought for and found under the dead, showing some signs of life. On being placed in the window he is recognised by the Surajah-Dowla, who orders the release of the survivors.

When Holwell came out, he describes himself as in a "high putrid fever," too weak to stand. After undergoing the fatigue of being carried from place to place, he and three others are loaded with fetters on the morning following their release, and he passes the night in dripping rain, and gains relief from his fever by an outbreak of large painful boils covering him from head to foot. Galled by his fetters, his legs streaming with blood, and compelled to march in a scorching sun, his right leg and thigh became the seat of a painful inflammation; he has a fresh attack of fever; and, at length, a regular fit of the gout

in the right foot and ankle, the first and last he ever had, forms a fitting climax to his sufferings.

To some such sufferings must warfare often expose the prisoner, and even the victorious soldier himself, when billeted on the inhabitants of towns and villages already crowded, as well as the unfortunate people forced to take shelter from showers of shot and shell in the cellars of their houses.

From cases of overcrowding, carried to the point of suffocation ; from cases in which, as in the Round House at St. Martin's, the space, if its dimensions are rightly stated, would barely allow the inmates to stand, or, as in the Black Hole at Calcutta, to squat upon the ground ; or those cases again in which, as in the county jail at Warwick, in Howard's day, thirty-two felons fettered in a crowded dungeon, twenty-two feet wide, "were forced to stand up (and take a sort of miserable night-watch) while the others slept," I pass on to those in which, day after day, or night after night, the available space, in rooms generally of low pitch, does not exceed that needed for the recumbent posture, so that in the case of sleeping-rooms the floor may be said to be paved with narrow beds, touching each other. Need I tell you that this state of things, or something approaching it, or even going beyond it, has been found to exist in the houses and buildings most severely visited in all our epidemics, whether of home-growth, or imported. Such places were the homes of the jail fever, such are the haunts of the typhus of our own day, such the favourite resorts of the cholera, such the breeding-places of the fatal diseases of infancy and childhood, and of the pulmonary consumption of the adult.

I have at hand notes of cubic spaces rising by easy stages, from the 8 of St. Martin's Round House and the 40 of the Black Hole, through the 30 to 60 of

Marlborough-house, Peckham, formerly the Union Work-house and busy fever-factory of the city of London ; the 52 cubic feet of the most crowded rooms in Church Lane, St. Giles's, the scene of a great mortality both from fever and cholera ;* the 84 cubic feet of a village-hovel in Dorsetshire, where a very fatal fever prevailed ; the 100 cubic feet of the Parish-house near Launceston, a haunt of cholera ; the 136 cubic feet of the Drouet establishment for pauper children at Tooting, where, in the epidemic of 1849, the cholera slew 170 children in three weeks ; the 147 cubic feet in the unhealthy barracks of Dover Castle ; the 150 cubic feet of the Wood Street Compter, another notorious haunt of jail fever ; the 170 cubic feet of the Cambridge Town Bridewell, smitten with jail fever in 1774 ; up to the 202 cubic feet of a London printing-office, where I found the deaths from consumption following as fast on each other as deaths from some contagious fever might do ; and the 228 of certain sick-wards of Christchurch Workhouse, where, in 1848, gangrene of the mouth prevailed.†

Setting aside the cases in which the victims were children, and fixing our attention on those in which the inmates were adults, we find ourselves in presence of two diseases in which we are specially interested—*consumption* and *fever*, the chronic and acute plagues that ally themselves in a special manner with overcrowding.

Of the dependence of consumption on this, as one of its leading causes, there can be no doubt. We have been taught this, both in the case of animals and of men. But I am not aware that we have any data by which to measure its force and efficiency. We are not able to say how many men, presumably healthy to begin with,

* Journal of the Statistical Society, Vol. xi. p. 1.

† Report on Metropolitan Workhouses. By Dr. A. Farre, Dr. Martin, and Mr. Toynbee (1848).

would perish by consumption if made to serve by day or sleep by night, or, worse still, to occupy both as living-room and dormitory—the case of soldiers—a given narrow space for a specified time.

The nearest approach that I know of to a solution of this question is furnished by the facts relating to London letterpress printers, which I laid before the Health of Towns' Commission in 1844. They are stated at length at p. 89 of the first volume of the Commissioners' first Report.

My data consisted, on the one hand, of accurate measurements and careful calculations of cubic space; on the other, of replies to simple and uniform questions having for their object to ascertain the number of men who had spat blood, and of those (often the same men) who stated that they were very subject to colds. These measurements and calculations, and these replies were the materials for the statements made to the Commission.

On summing up my facts, I found that I had questioned 320 men working in rooms of very different sizes; and that I could institute instructive comparisons between men occupying narrower and wider spaces, or working in different floors more or less freely communicating one floor with another.

All the comparisons led to the same result: the establishment of the same vital truth—that consumption (inferred from the existence of the leading symptom, hæmoptysis) and colds (doubtless comprising attacks of consumption), were uniformly rife wherever the cubic space was smallest, or the air most close, hot, and foul. I will content myself with two instructive comparisons.

Forty men worked in five rooms with 303 cubic feet of air per man; other forty in other five rooms with 789. Of the forty in the smaller rooms, five had had hæmoptysis, and six were subject to severe colds; of the forty

in the larger rooms, not one had spit blood, and one only was subject to severe colds.

My second comparison throws the 320 men into three groups of nearly equal size, all comprising more than a hundred. The first group worked in rooms affording to each man less than 500 cubic feet of air, the second had from 500 to 600, the third more than 600. Reducing all these groups to the standard of 10,000, I found that of the first group 1,250 would have spat blood, of the second 435, of the third 396; while 1250 of the first group, 348 of the second, and 198 of the third respectively would have been subject to severe colds.

These figures bring us as near as we can hope to arrive towards an answer to the question—What number of consumptive cases would result from the occupation day by day, for long periods of time, of spaces furnishing to each man less than 500 cubic feet of air, when compared with spaces supplying, let us say, more than 800 cubic feet? We have fair ground, I think, for replying that if the men occupying the larger space would lose 400 in the 10,000, those occupying the narrower space would lose at least 1200, or three times as many. Or, we may put it thus:—A body of letterpress printers 10,000 strong might be made to undergo a waste of 800 lives by being forced to work in rooms having, one with another, a less capacity than 500 cubic feet of air per man, with, of course, the existing objectionable modes of warming and lighting.

Whether this waste of life would take place in a body of 10,000 soldiers, condemned to live and sleep in rooms of the same narrow dimensions, it is, of course, impossible to ascertain. But we know that, about fifteen years ago, the barracks in every part of the United Kingdom contained rooms of these narrow dimensions. And we also know that, both in 1858 and twenty years earlier,

the soldiers of all arms, but the Foot Guards especially, were subject to a very high mortality as compared with any healthy standard.

The figures relating to both those periods—to the seven years from 1830 to 1836, and the period preceding 1858—afford data for more than one instructive comparison. Perhaps the most instructive is that between the Household Cavalry and the Foot Guards. In the interval from 1830 to 1836, the death-rate of the Household Cavalry was a little lower than that of the population of London at soldiers' ages; 150 per 10,000 of the London population, 145 per 10,000 of the Household Cavalry. But for the Foot Guards it was 216 in the 10,000! And though the deaths from *fever* were nearly the same in the two corps, the first suffered a mortality by pulmonary consumption of 81 in the 10,000, the second of 141. The later returns show a marked improvement in the health of the Household Cavalry, but a slight amendment only in that of the Foot Guards; for the annual death-rate in 10,000 was 110 in the one, and 204 in the other.

The difference in the death-rate by consumption (81 in the Cavalry, 141 in the Guards) coincides, be it observed, with the fact that the Horse Soldier is both soldier and groom, and with this other fact that the cubic space allotted to the one happens to have been nearly a fifth larger than that assigned to the other. Indeed, prior to 1847, the difference was nearly one-fourth.

This is all I am able to say on this very important subject. I refer you for fuller information respecting it to a lecture of mine "On the Sanitary Condition of the British Army, and especially on the Want of Space in Barracks," originally published in the second volume of the Journal of the United Service Institution, but since issued in a separate form; and pass on to that form of

overcrowding which consists in too many houses, or other erections, on a given space, with the impurities which commonly collect in and around them.

I may treat this subject very briefly ; for it is matter of simple notoriety that such overcrowding, with such unclean accompaniments, has been associated, in every period of our history, with the most destructive pestilences : with the Black Death of the fourteenth century, the Sweating Sickness of the fifteenth and sixteenth centuries, the Plague of the sixteenth and seventeenth, the Jail-distemper which showed itself so often and in so many places during the fifteenth, sixteenth, seventeenth, and eighteenth centuries, the Cholera of our own times, the Dysentery which figures so constantly in the London Bills of Mortality, and the continued fevers, which, under so many names (as the Spotted Fever and Parish Infection of the old bills, and the Typhus, Relapsing, and Typhoid Fever of our more exact nomenclature) have always been the scourges of the crowded and uncleanly members of our population.

Of the exact loss of life which these several pestilences inflicted on our ancestors we have few accurate and trustworthy records. The ravages of the Black Death have been roughly set down at 9 in 10 of the populations attacked ; the Plague, as it occurred in London, was reputed to have destroyed a fifth part of the inhabitants ; and the Jail Fever and Small-pox certainly proved very destructive to life. One very accurate record, showing what ravages one of the old pestilences might commit, we do possess in the history of the Plague at Eyam, in 1665. There, in the space of thirteen months, it swept off 267 in 350 inhabitants, or about 7 in 9, and out of two neighbour families (the Talbots and the Hancocks) numbering 15, carried off all but one.*

* See "Public Health," Part I., Lecture IV., p. 93.

These figures certainly lend an air of probability to the very highest estimates of the ravages of the Black Death—an aggravated form of Plague—that occurred more than three centuries earlier, when all the causes that promote the fatality of pestilences, were certainly more extensively diffused and more intense in their operation.

Overcrowding, as it has prevailed in civil hospitals, both here and in France, and the fearful mortality to which it formerly gave rise, is also a matter of notoriety. We are able to point out among its effects the early deaths of infants from convulsions, the fatal puerperal fever of women, the miscarriage of wounded persons and the subjects of operations, through erysipelas, pyæmia, and hospital gangrene, and the spread from patient to patient of every kind of contagious malady.

The baneful consequences of this form of overcrowding were but slowly recognised in England, still more slowly in France. How our military hospitals lagged behind our civil ones in this respect may be inferred from measurements and calculations made in 1857. While ten London hospitals showed an average cubic space of 1,472, and a minimum of 800, and twenty provincial hospitals an average of 1,075 and a minimum of 653, forty-six military hospitals yielded the disgraceful average of 655 (the minimum of the provincial hospitals), and 400 as a minimum (being just half the least cubic space in any London hospital).*

I must not quit this subject without alluding to that overcrowding of ships which sometimes takes place in times of peace, though it is comparatively rare in vessels of war.

Of this overcrowding, accompanied by that disorder

* See Tables appended to "The Sanitary Condition of the Army."

and neglect of cleanliness which place it in the same category as the overcrowded town or village, we had some lamentable examples in the year 1847, when the Irish Famine Fever was prevailing, and emigrants were leaving Ireland for America in very large numbers. We have it on the authority of the Montreal Board of Health that our emigrant vessels were allowed to ship two or three times as many passengers as the same vessels would have dared to carry to a United States port; and these figures show the results of this procedure. In ten vessels arriving at Montreal in July, 1847 (four from Cork, and six from Liverpool) there were 4,427 passengers, of whom 804 died on the passage, and 847 arrived sick. The *Larch*, from Sligo, lost 108, out of 440 passengers, and had 150 sick; the *Virginus* lost 150 out of 496, and had 186 sick; and the *Avon*, the scene of horrors far surpassing those of the Black Hole of Calcutta, lost the majority of the passengers, and all the crew except two.

In all these cases, and in none more than on board the *Avon*, the terrible sickness and mortality were largely attributable to the savage habits, and superstitious clinging of the living to the dead, of their Irish passengers. Such scenes, we may hope, can never again occur, even in times of scarcity and fever. They were possible in 1847 in the absence of legislation; but the Passenger Act of 1855, amended in 1863, must have effectually guarded against their recurrence. How necessary such legislation is, and will be, so long as mercantile greed finds an ally in personal neglect of all the rules of decency and health, we may infer from what we know to have occurred as late as the year 1868 on board ships freighted with German emigrants from Hamburg to New York. I condense the following account from a summary statement of what befell the ship *Leibnitz*, a statement to

be found in a leading article of the *Times* newspaper, under date February 10th, 1868.

On the 2nd November, 1867, the *Leibnitz* sailed from Hamburg with 544 German passengers, and a cargo of wool and hides, and after a voyage of seventy days reached New York. Of the 544 passengers no less than 150 were crowded together in close proximity to this savoury merchandize, in a part of the ship known as the lower steerage, just above the keel, where the bilge water collects, in a vault formed of a layer of planks loosely resting on the lower beams of the vessel, and lighted only by the rays that found their way through a hatchway on the upper deck. During the whole of the voyage, not a scuttle or bull's-eye was opened ; so that in this gloomy den there was no ventilation whatever, and the air was so foul that the lanterns hung there would not burn. Of the utter loathsomeness of the whole vessel no words that I can use would give an adequate idea. The ship, as it lay in the harbour of New York, surrounded itself, so to speak, with a mephitic atmosphere which shut out the view of every object distant two or three feet. The treatment of the unhappy passengers was in all respects in keeping with the condition of the ship. The rations were scanty and bad, often rotten ; the butter rancid, the beans and sour-kROUT thrown overboard, even by the hungry, and the supply of water to people sweltering in insufferable heat and indescribable nastiness, was only half a pint a day. Even sick passengers had no better dietary ; they had no doctor on board, and no medicines after the first fortnight. They died apace, like rotten sheep, and their corpses were kept in the steerage for four-and-twenty hours. Whole families were swept away ; husbands and wives died, leaving their unprotected children who, when asked where their parents were, pointing to the deep water, answered with tears and sobs, "Down

there." It is with a sensation of surprise and relief that we find only 108 deaths out of 544, laid to the charge of all this neglect and cruelty. So wonderful is the power of resistance and endurance stored up in the human body!

The drinking of tainted water is a cause of disease which is very likely to affect armies in the field, less likely to prevail in our ships of war. I speak of the taint that the water of wells and streams receives from the excreta of persons suffering from such diseases as dysentery, cholera, and typhoid fever. It is probable, as I have elsewhere suggested, that the accusations of poisoning streams and wells which have been put forth during every great epidemic, from the Black Death down to the Asiatic cholera, were not always the offspring of ignorance and panic, but, in some cases at least, the result of real observation, mistaken not as to the fact of contamination, but only as to its cause.*

The fact that the poison of disease may enter the body by this channel (in the water we drink), has, as you are aware, lately received an unexpected confirmation, and the principle an important extension in the group of cases of scarlet fever which Dr. Ballard not long since succeeded in tracing to milk tainted by persons recently and imperfectly recovered from the disease.

Insufficient or improper food is the last of the three leading causes of disease of which we have had large experience in time of peace, and which is also one of the great dangers of a state of war. Scurvy and the dysentery so often associated with it, following on the defective supply of wholesome vegetables and ripe fruits, were once the scourges of our civil population, no less than of our armies and fleets. They attacked the prisoners in Mill-

* See "Public Health," Part I., Lecture II., p. 58.

bank so late as 1822,* and, even at the present day, it is not possible to contemplate a war of any duration without the most serious misgivings lest our commissariat should break down in this most difficult of all its arduous duties.

To form a clear idea of the possible ravages of scurvy, it will suffice to call to mind such cases as that of the English garrison at Oswego, in the year 1756, losing 200 out of 700, and having the whole remnant, with the exception of 80, unfit for duty; or that well-known case of the three ships of Anson's expedition losing, in less than nine months, 626 out of 961, and the solitary *Centurion* returning to England with much less than 200 of the original crews. How little of all this loss of life was due to actual warfare we all know; how much to aged, invalid, and ill-assorted crews, and the close confinement rendered necessary by boisterous weather, it is not easy to say.†

Of over-work, as a cause of sickness and mortality, I can only speak very briefly. That it is a very real and efficient cause, both in peace and war, there can be no doubt. To show what it can effect, by an extreme instance, I will refer you to my lecture on the Evils of Night-work and Long Hours of Labour in the case of the journeymen bakers of London. Let it suffice to state one fact. The compositors, to whose case I have already referred, I found to have spat blood in the ratio of twelve and a half in the hundred; the bakers in the ratio of thirty-one in the hundred.‡

In treating of over-crowding in its several degrees and forms, of tainted water, and of short or defective supplies of food, as the most constant and fatal incidents of war-

* See "Public Health," Part I., Lecture VI., p. 146.

† See "Public Health," Part I., Lecture VI., p. 154.

‡ Contributions to Sanitary Science, No. I.

fare, I by no means undervalue those other foes of the fighting man which bad customs, bad management, bad plans, bad strategy, are constantly creating. We know how the sacrifice of utility to show has affected the soldiers' clothing, how the unchecked greed of contractors has afflicted him with bad clothes and rotten food, how little account has been taken of the salubrity of the countries to which he has been sent, how little of the seasons and their requirements. He has had his feet galled and crippled, he has been choked with a rigid leather stock, his chest has been constricted, his shoulders weighted and galled with a heavy and ill-poised knapsack ; he has been exposed to pinching cold in summer clothing, has been made to march under a tropical sun without protection for the head, and has had to face the dazzling snows, or hot-glaring sands, without any attempt to save his eyesight.

How the soldier himself has carried with him, wherever he has gone, that gluttony and intemperance which form the standing disgrace of our whole population, all our military histories tell us ; and I shall have occasion to allude to it once at least in a future lecture.

Fortunately, the time has passed when the armies of England first bred disease abroad, through manifold neglect of all wholesome habits and appliances, and then imported it among our civil populations ; and that time, too, when our armies and fleets, recruited largely from our prisons, carried with them the terrible jail-distemper, and the equally formidable and then unmitigated small-pox.

I shall have more to say on this interesting topic in my last lecture. In the two that follow, I shall lay before you (to serve as standards of comparison, whereby to measure other wars, past and to come) the figures relating to the destruction of human life during the long fierce struggle, by sea and land, that ended in 1815.

LECTURE X.

THE NAVY.

I DEVOTED the greater part of my last lecture to the establishment and illustration of certain leading propositions relating to warfare generally, but especially to military operations, which, if set forth in due form, would be to the following effect :—

1. That war consists in the bringing of one crowd of trained, disciplined, and armed men into fierce and angry collision with another crowd.

2. That during the preparation of these crowds for war, they are subject, both in barrack and hospital, to an overcrowding which impairs health and destroys many lives.

3. That among the diseases so produced, *pulmonary consumption* and *fever* hold the first place.

4. That, in actual warfare, overcrowding in its several forms and degrees, and with accompaniments which our experience in times of peace proves to be most fatal to health and life, must come into frequent play.

5. That such overcrowding, with supplies of food deficient in quantity or in the essential elements of fresh meat, vegetables, and fruit ; water impure, and perhaps tainted by human excreta ; clothing ill-adapted to the form, or unsuited to the climate or season ; exposures and fatigues, inaction and *ennui*, gluttony and intemperance—these, in all degrees and in every combination, suffice of themselves to account for much of the disease and loss of life which attend on war.

Whether the mortality, due to causes such as these, is largely increased by the casualties of battle, and, if so, to what extent, is one of the questions which will receive an answer in this and the following lecture ; for I shall use the casualties of actual fighting—the killed and wounded—as my standard of comparison by which to measure the losses by disease.

In any inquiry into the ravages of disease, and loss of life occasioned by war, it is natural, I think, to begin with the navy ; for the facts relating to this branch of the public service are more simple and should be more easy to ascertain than those that relate to the army. The fleet, or the ship, is more definite and self-contained than the army or the regiment.

Beginning then with the navy, we have three orders of facts—three kinds of warlike contest, of which we must take cognizance, if we would ascertain the loss of life that results from actual fighting :—I mean actions between single ships, actions between fleets or squadrons, and naval attacks on land defences. I will state briefly what the loss of life entailed by these three warlike procedures is.

Mr. Hodge, in his paper on the navy, gives the particulars of thirty-five actions fought by English ships against French or American, in which eighteen were decided in our favour by the capture of the enemy's vessels, eleven against us, and six were indecisive.

These thirty-five actions seem to have been chosen out of the 576 which took place between 1793 and 1815 (being at the rate of more than one a fortnight for the whole of that long contest), as furnishing the most precise details of length of struggle and loss inflicted and sustained, in actions bravely contested.

I will give you the results for our own vessels per 1000 men engaged :—

Loss in killed 56 ; in wounded 144 ; total casualties 200 ; or 20 per cent.

From the same source I obtained the particulars of twelve actions between fleets or squadrons :—

The loss per 1000 of our men engaged was in killed 16 ; in wounded 52 ; total casualties, 68 per 1000.

Six naval attacks on land defences, entailed on us a loss of 26 killed, and 57 wounded ; or 83 casualties per 1000 of our men engaged.

These figures I will arrange in order, beginning with the lowest :—

Actions between Fleets and				Killed.		Wounded.		Total.
Squadrons	...	...	...	16	...	52	...	68
Attacks on Land Defences	...	...	...	26	...	57	...	83
Actions between single ships	...	...	...	56	...	144	...	200

If now I bring together these three forms of naval combat, I obtain, as the losses per 1000 sustained by 121,654 English sailors, 21 killed ; 59 wounded ; and 80 killed and wounded.

A near approximation, easy to bear in mind, would be :—killed 2 ; wounded 6 ; killed and wounded 8 per cent.

These averages may, of course, be very largely exceeded. Thus (to take an example from each class), Sir William Hoste, in his action off Lissa, in 1811, suffered a loss, in killed and wounded, of 212 per 1000 ; Nelson, in the attack on Copenhagen, in 1801, of 118 per 1000 ; while the *Shannon* in her duel with the *Chesapeake* in a quarter of an hour lost at the rate of 271 in the 1000 killed and wounded, or 18 in the minute ; the heaviest loss, if measured by time, our navy has perhaps ever sustained.

I may mention, in passing, that Lord Exmouth, in his attack on Algiers, in 1816, lost in killed and wounded, 147 per 1000. At Sebastopol our loss was only 29 per 1000.

There is one kind of naval operation which I have not yet noticed, because the figures that relate to it have not been put into a form admitting of comparison with those I have just laid before you ; I mean boat-attacks, and cutting-out expeditions. I have brought together just to serve my present purpose, the particulars of 15 such actions that took place between 1794 and 1800, eight of them in the last-named year. These actions, one of which was attended with scarcely any loss, and two with no loss at all, issued in the capture or destruction of upwards of 30 armed vessels, and the dismantling of several forts, at a cost of 15 men killed, and 87 wounded, being one man killed and not six wounded to each of the 15 attacks.

Such great results achieved at so small a loss lend some air of probability to ancient histories relating to battles on land, and to such more modern accounts as credit our starved and sick troops at Agincourt, with 10,000 of the enemy killed, and 14,000 prisoners earned by the sacrifice of forty men !

Although it is usual to apply the word "loss" to the aggregate of killed and wounded, it would be more correct to consider as lost only the killed and those who succumb to their wounds, or to operations rendered necessary by them, within a short period of the conflict. What proportion these bear to the killed we do not know. We might learn it perhaps by bringing together casual statements to be found scattered through the works of our naval surgeons and physicians.

One such statement is recorded by Trotter in his *Medicina Nautica*. It consists of a nominal return of the officers of every rank killed and wounded in Lord Howe's great victory of the 1st of June. The killed were seventeen, and the wounded forty-four, and of these forty-four, six, or about one in eight, died of their wounds. As

naval officers are much mixed up with the men in action, and the ratio of killed to wounded in the two classes does not differ greatly, I assume for the present the deaths by wounds to be an eighth of the wounded; and when we consider the slight injuries reported to the surgeon as *wounds* by candidates for "smart money," I think that this estimate is not too high. If we accept it, the figures for all forms of naval engagement taken collectively would stand thus: killed, or dying of wounds, 28; wounded, but not mortally, 52; killed and wounded, as before, 80 per 1000; or, approximately, 3, 5, and 8 per cent.

As these figures cannot be used to determine the losses caused by fighting and by sickness respectively, I must look for this information to returns of a different order. I find it prepared to my hand in a table given by Mr. Hodge, as the ultimate result of his inquiries and calculations. I will try to express his conclusions in a few words:—The royal navy, during the twenty and a half years of actual warfare, consisted of 110,180 men, on the average of all these years, and these sustained a loss of 6663. There were that number of fatal casualties in action. They had a further loss of 11,985 (little short of double the number), in men drowned or destroyed in ships, wrecked or burnt, in excess of like casualties occurring among the same number of men in peace; and 44,662 men perished by disease or ordinary accidents on board, this number also being in excess of those who would have died from the like causes in time of peace.

The last column in the table from which I quote gives the result which we, as medical men, are most interested in knowing. Let us suppose the number 100,000, to represent the deaths caused by naval warfare, over and above those which would have occurred in peace, and we shall find them distributed as follows:—

Casualties in action, 10,524.

Drowned or destroyed in ships, accidentally wrecked or burnt, 18,931.

Deaths from disease, or ordinary accident on board, 70,545.

In other words, if we take the casualties in action at 10, deaths from disease will be 70, or nearly seven times as many. If we take deaths by drowning and burning as our standard, the proportion will be seven from disease to two by those other causes.

Hitherto I have been speaking of disease—of sickness—as a cause of death, measuring its prevalence by the casualties in battle, as a standard of comparison. I have now to treat of sickness by itself, as a deduction from the number of available fighting men. My observations under this head will apply to both branches of the public service, though primarily to the navy.

This topic of sickness is not an easy one to treat, for the thing itself is subject to infinite variety, in kind and degree, and it is not possible to set up any standard of comparison to which to refer the number sick during any given operation of war.

In seeking for a standard of sickness, beyond the limits of army and navy, we should first have to reject as unsuitable all bodies of men not picked or selected as being free from physical defects. We should next have to set aside even those picked or selected men (such as our police and fire brigades), whose duties differ, as they must needs do, from those of the sailor or soldier in actual warfare. And then we should seek out, if it were possible to find it, some instance of warfare, by sea and land, in which every precaution against disease had been so carefully and skilfully taken that the resulting sickness should be the least possible.

Let us suppose such a result to have been arrived at,

in some particular instance, yet it is obvious that the figures so obtained, would only admit of application to warlike operations of the same class carried on in the same country, or district of country, at the same season of the year, and under what we cannot even imagine, the same atmospheric conditions—the same “*epidemic constitution*.” A fleet, an army, or an expedition in which both services are called jointly into play, may have to encounter an enemy more ruthless than any human foe in such a malady as the cholera or the plague; it may be suddenly prostrated by influenza; it may waste away under the slow operation of causes that find their ultimate expression in scurvy and dysentery, or in one of the many forms of fever, intermittent or continued. Or some ill-fated expedition, like the Crimean, may encounter the cholera at the very outset, and then pass in succession through the bitter experiences of scurvy and fever.

But though the attempt to establish a standard of sickness applicable to fleets or armies engaged in actual warfare must needs prove unsuccessful, we may call to mind with advantage a few of the facts respecting sickness which are best ascertained.

Take, for instance, the age of the sailor or soldier. The fact that the body does not attain its full development till about 27 years of age, is in harmony with the multiplied experience which assigns to young recruits, and especially to young soldiers, an extreme liability to sickness, when subject to the fatigues and exposures of war; while, on the other hand, that other fact that a man of 50, in civil life, is found to suffer more than twice the amount of sickness which falls to the lot of a man of 30,*—a fact obviously applicable to the case of the fighting man—will justify us in expecting an increase of sickness

* F. G. P. Neison's Contributions to Vital Statistics, p. 96.

among veterans, even after we have made every allowance for the experience and prudence which grow with age. I have elsewhere shown that some part of the excessive mortality attending Anson's expedition was due to the raw recruits, invalids, and men upwards of 70, whom he was forced to accept as part of his crews.*

Take next the condition of the sailor and soldier about to enter on the busy work of war. We know that men may be much out of condition without being placed on the sick list. They may carry with them from the crowded receiving ship or barrack the seeds of disease which sanitary neglects have sown—of consumption, which a few weeks of exposure and fatigue may ripen, of fever, which a few days may develop. And we know that it is by the falling off of the young, the infirm, and the diseased, that those armies are gradually formed of which the commander can say with truth that they are ready to go anywhere and to do anything. Such was the army with which Wellington in 1814 invaded France and marched to Bordeaux; such the army with which we were prepared to continue the war in the Crimea, had our allies been equally willing with ourselves. We have known also to our cost how soldiers sent to contract intermittent and remittent fevers in such swamps as those of Walcheren, or cholera on the road to the Crimea, may recover only to fill our hospitals at home, or swell the sick lists of the Peninsula or Balaclava.

The season of the year must also be taken into account if we would rightly estimate any special return of sickness. Though we know that here in England, and probably elsewhere, the order of the seasons in respect to sickness is by no means uniform, but subject to variation from year to year, we may lay it down, as a

* See "Public Health," Part I., Lecture VI., p. 155.

general rule, that with us sickness tends to vary directly, but mortality inversely, as the temperature. Nevertheless, under an exceptionally high temperature in summer, or an exceptionally low temperature in winter, sickness and mortality may coincide. Both may be at a maximum together. And we know too how much sickness and how many extra deaths may result from transferring troops from our temperate climate straight to such a different one as that of India at the hottest season, so as to allow no time for acclimatization.

One other illustration of the difficulty of establishing a standard of sickness is afforded by the still more remarkable fluctuations that occur from year to year; in the same seasons, or months, of different years, or in the several seasons of the same year.

Though our death registers are by no means exact measures of the prevalence of sickness, they may fairly be used by way of illustration. Let us take, then, the facts as they relate to London.* In the short period of fifteen years (from 1840 to 1854) the deaths in London, per million of inhabitants, presented, as I found, maxima and minima, of which these are examples:—

Diseases of the heart proved fatal to 530 one year, and 952 another; old age was the assigned cause of death in 911 instances one year, in 1884 another; and there were in one year 179 sudden deaths, in another 455.

The whole group of zymotic diseases was credited, in round numbers, with 4000 deaths one year; with 12,000 deaths, or three times as many, another.

If we take the diseases most influenced by the weather, we find asthma destroying 260 one year and 728 another,

* Journal of the Statistical Society. Year 1855. For a somewhat different use of the same facts see "Public Health," Part I., Lecture II., p. 40.

and bronchitis 271 and 2083, or nearly eight times as many. Dysentery is entered one year as the cause of 38 deaths, another of 163; and diarrhœa of 246 and 1522, or nearly seven times as many one year as another.

And, if we take the leading contagious maladies, as measures of the force of the *epidemic constitution* of the air, we have typhus ranging from 615 to 1600, measles from 249 to 1122, scarlatina from 354 to 2132, and small-pox from 87 to 890, one year proving more than ten times as fatal as another.

But these remarkable contrasts of year with year are not limited to diseases that are obviously amenable to atmospheric influences; for we have purpura credited with 6 deaths and 36; carbuncle with 1 and 16; and syphilis (so important to our army and navy as a disabling malady) fluctuating between 11 and 76.

Let us now suppose the young adult males of this London population to be sifted, and those that appear healthy and well formed to be drilled as soldiers, and sent out to foreign battle fields, and we shall understand what large or what small losses they might sustain, according as the year happened to be as unhealthy as 1849, or as healthy as 1850—a year afflicted with cholera or free from it; a winter favourable or hostile to lung-disease; a summer promoting diarrhœa or checking it.

Nor are these contrasts afforded by our metropolitan death-registers more striking than those exhibited by records of sickness, of which I find a very valuable specimen in a return made by a naval surgeon, Dr. Walker, to Sir Gilbert Blane, of the attacks of sickness and the deaths that took place among some 6000 prisoners of war, in every month of the eight years from 1806 to 1813 inclusive.*

* Sir Gilbert Blane's Select Dissertations, Vol. i., p. 100.

If we take the facts by the year, we have 9 attacks per 1000 prisoners in the healthiest year, and 22 per 1000 in the most sickly; 4 deaths per 10,000 in the least fatal year, 12 in the most fatal.

If we compare month with month, we have 38 per 1000 sick in the most sickly month (March, 1807), and less than 4 per 1000 in the most healthy (September, 1811).

And, again, if we limit ourselves to the figures of the same month, we have the sickliest March of the eight, yielding a maximum of 38 per 1000 sick, and the healthiest a minimum of 11; the sickliest October of the eight, 21 per 1000, the most healthy 4 per 1000, or less than a fifth.

The most striking contrast afforded by any one month is, however, to be found in August. In the year 1807, that month was credited with 25 per 1000 attacks of sickness, and 5 in 10,000 deaths; but in 1812, there were only 3 sick men in 1000, and not 2 deaths in 10,000. The sick, therefore, were more than eight times as numerous in the August of 1807 as in that of 1812.

If we condescend to days—to the sick at any one time—we find Dr. Walker stating that he had once as few as 7, and once also as many as 175. I find that the monthly average for the whole period is only 14 per 1000, and for the last four years less than 10 per 1000. The deaths for the whole eight years were but 1 per cent. per annum.

It may be interesting to add, that I find the four warmest months of the eight years, taken together, yielding 112 per 10,000 sick, and 6 per 10,000 of deaths; while the four coldest yield 169 per 10,000 sick, and 16 per 10,000 dead; the four temperate months giving the intermediate figures of 136 per 10,000 sick, and 8 per 10,000 dead. But many of these prisoners were natives of climates warmer than ours.

These figures are, I think, of special interest, for they relate to men of mixed nationality, picked fighting men, many of them natives of warmer climates, suffering captivity at a place (Norman Cross) situate in a marshy district, but with the combined advantages of "cleanliness, free circulation of air in the building, nutritious food, and regularity of life."

Well might Sir Gilbert Blane cite these facts and similar ones from the depôt at Dartmoor (with its 74 sick in 7,500 prisoners), and the ships in Hamoaze (with their 61 in 6100, on the 20th August, 1812), as a triumphant refutation of M. Dupin's "*bitter invectives*" against a government which had treated him with rare indulgence and liberality, and a people who, whatever their other faults, have never been justly accused of cruelty to vanquished foes, unless, as in the great Indian mutiny, it be under the direct influence of that surprise and panic which has ever been found to breed a short-lived cruelty in nations naturally the most humane.

As the figures I have just brought forward do not encourage us to search further after a standard of sickness to which to refer the state of our fighting men in actual warfare, I am reduced to the necessity of placing before you some of the most striking contrasts which the state of war, by sea or land, has afforded. I will take the navy first, then the army.

In treating of sickness in the navy during the war of the Revolution, I cannot, I think, do better than refer to the "General Abstract of the Health of the Fleet" from January 1, 1794, to December 31, 1797, as given by Dr. Trotter in his *Medicina Nautica*. But as the year 1794 was that in which the glorious victory of the 1st of June was won, I ask you to let me pause for a moment while I offer a few preliminary remarks upon an event which was curiously influenced by the sickness prevailing in the two hostile fleets.

Never had England more felt the want of some great warlike success than in the beginning of the year 1794. Though our soldiers and sailors had fought well, and done their duty bravely whenever they had met their foe, Toulon had succumbed, more through the fault of our Spanish allies than of ourselves; and in Holland after many a glorious feat of arms, we had yielded to overwhelming force; and we had but half completed the conquest of Corsica. It was vain to look to our army for the success we so much needed; for in that direction the prospect was growing worse and worse. The allies, once within 160 miles of Paris, had lost their opportunity of finishing the war at a blow; and France outnumbering the aggregate of all their forces in the proportion of more than two to one, had learnt the lesson of concentration, and had practised it with fatal success, against armies moved by many masters and distracted by jealousy and conflicting interests. Russia, Prussia, and Austria, showed themselves more intent on partitioning Poland than on conquering France; and Austria, the most loyal and constant of our allies, was crippled, and almost paralysed by her Aulic Council. So that France, practising her new-learnt lesson of concentration, with commanders who had before their eyes the alternative of success or the guillotine, and troops conscious that their lives were not in greater danger on foreign battle-fields than they would have been at home, went on from victory to victory, from one success to another. We then, here in England, were oppressed by a sense of failure, and stood, as I have said, sadly in need of some signal success which would inspire us with confidence and hope, and nerve us, and knit us together in a firm determination to face the costly, hazardous, and uncertain future.

In this, our hour of danger and difficulty, the first gleam of sunshine came to us from the sea, on the glo-

rious 1st of June. On board Lord Howe's fleet there were no discordant nationalities, no conflicting commands, and, what was hardly less important, there was no sickness. Let us see how this happened. About six weeks before the date of Lord Howe's victory, Dr. Trotter was appointed physician to the fleet, with the confidence of his commander and full powers to act. Early in the year, and prior to his appointment, fever had been prevalent and fatal in several of the ships; and in one of them it had been associated with the flux, and caused 270 attacks of illness, and ten deaths. This happened, as I have said, early in the year; but as late as the 16th April, when Trotter inspected the fleet, there was a sick-list of 725; 53 sailors were confined to bed, and 21 were proper objects for an hospital. By prompt and judicious measures, matters were so mended that on the 1st May (a fortnight later) the fleet was reported to be in perfect health; and so continued till the day of battle, when it bore into action 17,241 effective men, to combat in the same number of ships, armed with as many guns, but firing heavier broadsides, 2500 more men. But of the French crews a part, as I shall presently state, were anything but effective. The tangible fruits of Lord Howe's victory were seven ships of the line, including the notorious *Vengeur* which sank the same evening with 320 men on board. In the remaining six prizes the number of killed and wounded was largely in excess of our total loss in the whole fleet.

I have told you how the physician to the fleet had helped to "organize victory," by placing in the hands of his gallant chief the living *matériel* of the fleet in a state of first-rate efficiency. I will now tell you what the French had been doing. They had, as I have said, the same number of ships, but their crews were larger, and their broadsides heavier. They were well supplied too with

"medicines, surgeons, and assistants," and had "many articles of comfort unknown in our navy," "even live-stock." They, too, had had much sickness on board their ships, but they had not shaken themselves free from it. They took sick men by the hundred into action; so that when Trotter was sent to visit and report upon the prizes, he found fever and scurvy on board them all. Let us take the *Sans Pareil* (the Peerless) as a specimen. She sailed from Brest six weeks before, about the time that Trotter was making his inspection of our fleet. She had 1000 men on board, of whom many died early in the cruise, and sent a hundred fever cases to a corvette. The number of deaths was very great. After the battle we took from this one ship alone upwards of 200 prisoners, most of them suffering from scurvy and spotted-fever, into the *Majestic*. This fever-stricken vessel was but a sample of the seven prizes, for the *Vengeur* was infected, and Trotter found the rest "sickly," and afflicted with a fatal contagious fever; and this fever had the usual concomitants, and acknowledged the usual causes. The ships were "dirty to an extreme degree;" and Trotter learnt that in the *Sans Pareil* the lower deck-ports had never been opened from leaving the harbour till the day of action.

Here, then, in this formidable French fleet we had disease, with filth and foul air, for associates, organizing not victory but defeat—supplying the French, if they would condescend to so mean a thing as truth, with a real explanation of part of their miscarriage, if not of all. But the flattering fiction of the unconquered *Vengeur* was far more to their taste than the unsavoury reality. For my part, I shudder as I think, even at this distance of time, of the glorious 1st of June, as it might have been had the state of things on board the two fleets been reversed; had the French, who never fought better, been

reinforced by health, and we crippled by disease. If we would know how terrible a thing this fever was, we must pursue the history of this great fight a little further. I have said that one of our ships, the *Majestic* received more than 200 French prisoners from the *Sans Pareil*. The crew of the *Majestic* had been set to superintend the cleansing of the lower deck of this unsavoury French ship, and a lieutenant and two midshipmen so employed fell early victims to the infection. Then, from this ill-fated *Majestic* the pestilence spread to the other ships, affecting ten severely and five slightly. So prevalent and so fatal was this fever that, from the 11th of June to the end of July, 800 patients were sent to Haslar Hospital; of whom 40, or 1 in 20, died. At the same time, the French prisoners in the neighbourhood of Portsmouth and Plymouth were dying fast of this same fever, infecting nurses and attendants, and their guards of the Middlesex Militia. When towards the end of September this work of destruction, the terrible revenge of France, had come to an end, Trotter sums up the painful but instructive history in these words, "Thus ended an infection, the most general that was ever spread in a large armament, and which, under other situations of season and discipline, might have proved fatal to the Channel Fleet of Great Britain."

This is a grand and touching example of disease in one of the three leading characters in which I recognise it—disease the impoverisher, disease the disorganizer, disease the demoralizer. Here we have an illustration on a large scale of disease the disorganizer, in perfect harmony with all our experience. Disease it is that lets the enemy into besieged places, as at Kars; disease that mars the most promising expeditions, as at Walcheren; it was disease that retarded Wellington's career of conquest; it was disease, that fought for the enemy at

Sebastopol. Lord Howe's fleet encountered another enemy of the same class in the *Influenza* of 1795. In the space of six weeks (from January 18th to February 28th) 39 vessels had 5149 severe cases on the sick list, being an average of 132 per ship, the *Orion* and *Barfleur* having respectively 480 and 450. In this same year 1795, 200 men were seized in one night on board the *Fortitude* a ship belonging to the squadron of Admiral Kempenfelt. Such an attack of Influenza occurred among the Channel Fleet in the spring of 1782; and, to come down to more recent times, the *Canopus* in Plymouth Sound, had two-thirds of her crew struck down in one day; men, as Dr. McWilliam told us, in the prime and vigour of life and health, in high spirits at the prospect of being paid off, in an hour or two prostrated in mind and body, as if by some sudden blow, or unexpected reverse of fortune.

Dr. Trotter's abstract for the years 1795, 1796, is largely devoted to details respecting the scurvy. The severe winter of 1795 had been very fatal both to vegetation and to animal life. The price of provisions rose; fresh meat was served out to the fleet only once a week; and by the middle of March a general disposition to scurvy showed itself. This the doctor set himself to counteract by substitutions in the dietary, and by great and continuous exertions to procure vegetables and fruits, and lemon-juice for the sick. But in spite of all his efforts, the disease became very general. Seamen were attacked with scurvy at Spithead; whole ships' crews were overrun by it; whole squadrons had the disease in every ship, the hospitals filled with "scorbutics" from the shipping at Spithead, as well as from vessels returning at sea; and, in a word, the disease attained such a height that "if assistance did not soon arrive, there was danger that the whole fleet might be rendered inactive."

This was the state of things on the 20th April, 1795. It led to increased exertions on the part of Dr. Trotter, the whole country was laid under requisition for fresh meat, vegetables, salads, and apples; and the hospital ship *Charon* from which these things were largely dealt out, came to be called the *Doctor's Garden*. But the scurvy, in spite of every exertion held its ground, survived the heats of summer, and passed on into the year following, so that it was not till November 20th, 1796, that ships returning from sea could be reported in "perfect health."

Some idea of the prevalence of the scurvy may be formed from the statement that, from the middle of March to the middle of June, 1795, not less than 3000 cases, unfit for duty, had been cured on board ship, by the lemon or its juice, and that on the 31st of August Admiral Harvey's squadron of ten ships arrived at Spithead with 1085 scorbutic patients.

Blended with these accounts of the prevalence of the scurvy and of Dr. Trotter's valiant and persevering efforts to subdue it, we have incidental proofs of the curative power of lemons and their juice, and of the preventive efficacy of a liberal mixed diet. I must limit myself to one of these.

On April 17th, 1795, a squadron under Admiral Colpoys arrived at Spithead, with scurvy in every ship, and about the same time Rear-Admiral Harvey arrived, with four ships from the North Sea, in a still worse plight; for one of his ships, the *Prince of Wales* after landing fifty men at Deal Hospital, five of whom perished in the boat, brought a number ill to Spithead. But the *Thunderer* one of these four ships, returned in perfect health; for the crew, having lately shared some prize-money, "had furnished themselves amply, for the cruise, with every delicacy, even to live stock."

It will be seen, then, that our old foe, the scurvy, which had caused the total miscarriage of many a promising expedition in the 17th and first half of the 18th centuries,—of Sir Francis Wheeler, in 1693, Admiral Hosier, in 1726, and Admiral Vernon, in 1740—which so cruelly afflicted the crews of Anson's ships in this same year 1740, and to which Sir Gilbert Blane attributes six *drawn battles* that ought to have been victories, in the course of the Seven Years' War, and the American War, might still, in seasons of scarcity, succeed in invading our ships, squadrons, and fleets, and in resisting, for nearly two years, the most energetic and best directed efforts of medical science.

Nor, in spite of Howard's labours, and the wholesome legislation of 1774, were we yet able to shake ourselves free from another ancient foe, the Jail-distemper. For we learn that the *Colossus* commissioned at Plymouth in the autumn of 1796, took on board a crew entirely composed of raw Irish landsmen, the worst that ever came into a man-of-war, of whom a great part had been discharged from jails, and that three or four times during her fitting, she was infected with fever, one man falling ill, and then all the members of his mess; and the disease making its appearance again in the cruise off Ushant. Nor does this appear to have been a solitary case.

There is another disease by which our sailors have often suffered through communication with landsmen. I mean small-pox; respecting which also we have several details. But during the four years 1794 to 1797, I find notices of only thirty-nine cases occurring in six ships, the largest number in any one ship being twelve. As a rule, it was not of a bad type; and was by ordinary precautions limited to the few who suffered from it, aided by the inoculation of the few sailors whose prejudices could

be overcome. The following year, 1798, however, the disease prevailed more extensively, and in one ship (the *Captain* killed seven out of the fifteen whom it attacked.

I notice, in passing, the testimony borne by Dr. Trotter to the mildness of the disease imparted by inoculation. He had operated on near 300 children without a miscarriage, and he says, that in two or three general inoculations of seamen on board the hospital ship *Charon* not one had been confined an hour to bed.

Under date May, 1797, Dr. Trotter makes a brief reference to the *malignant ulcers* which particularly affected the ships of the line, *Queen Charlotte*, *Royal Sovereign*, *Saturn*, and *Terrible*. Some of these ulcers began on spots injured by slight scratches, bruises, or burns, or by minor surgical operations, but most as a small livid pimple that quickly inflamed and spread, with intolerable pain, fever, often delirium, and sometimes buboes. The ulcers ran speedily into gangrene and sphacelus, exceeding anything the doctor had ever witnessed in surgery; for often in the short space of a day or two, the whole integuments and muscles of the limb seemed to drop away, and a caries of the bone often followed." This malignant ulcer, and small-pox, were the prevailing maladies of the year following (1798).

There is still one disease to which Trotter calls our special attention, that affords so curious an illustration of the unexpected quarters, so to speak, in which most serious mischiefs may lurk, that I must detain you while I speak of it. The disease is *Syphilis*. At the time when Trotter wrote his abstract (he speaks of the matter under date March 6th, 1795), the sailors were subject to a charge, or fine, of fifteen shillings for the cure of this disease. To avoid this payment, they would resort to some of their messmates who professed the requisite skill;

cause medicine to be brought from land ; consult itinerant quacks at the sea-ports ; or conceal their state from the surgeon till they became subjects for hospital with the most dangerous symptoms. At length Dr. Trotter represented the evils of the system to the Admiralty with so much earnestness that a stop was put to the charge, and some addition made to the pay of the Surgeons in lieu of it. This much needed reform was, Trotter says, an epoch in naval improvements ; for hundreds of seamen had annually fallen victims to that unwise regulation. It proved most welcome and serviceable to all parties concerned ; and coupled with that other reform of the strange custom that required navy surgeons to supply their own medicines, must have greatly improved the *status* of our profession serving in the navy.

Before quitting this branch of my subject—the disease and mortality prevailing in the navy—I should like to have said something of sickness as distinguished from disease proving fatal. But the facts of this order are wanting for the whole period of the war. One contribution to a knowledge of this subject I am, however, able to make. On the 16th April, 1794, shortly after his appointment as physician to Lord Howe's Fleet, Trotter ascertained by inspection and official returns that there was a total of 561 sick men in the 36 ships that fought on the 1st of June (or six weeks later). These ships, with the *Phaeton* frigate, which was free from sickness at the date of the inspection, had an aggregate of 17,241 men. And if we take it at 17,000, we have a sick-list of exactly 33 per 1000.

Having now given you some idea of the diseases of our seamen at the end of the eighteenth century, I shall in my next lecture, pass to the diseases of the army, submitting them to the same treatment I have already adopted in the case of the navy.

LECTURE XI.

THE ARMY.

In dealing with military operations, I shall treat separately of battles and sieges, and among battles shall distinguish offensive from defensive ; and in sieges, those brought to a successful issue by assault and capitulation respectively, from those that have been unsuccessful. And in every instance I shall limit myself to the losses sustained by our own troops.

In eight offensive battles fought in the interval from 1793 to 1815, by 179,500 men, we had 12 killed per 1000, and 62 wounded ; our total casualties were therefore 74 per 1000.

In nine defensive battles, fought by 222,900 men, the killed were at the rate of 24 (instead of 12) per 1000, and we had 110 (in lieu of 62) wounded ; total 134.

Turning from battles to sieges, I begin with those brought to a successful issue by assault ; and I find the losses sustained by 62,800 British troops to have been 38 per 1000 killed, and 122 wounded ; a total of 160 per 1000.

In two sieges successfully terminated by capitulation, and employing 21,000 men, we lost 8 per 1000 killed, and 34 per 1000 wounded ; total 42 per 1000.

In five unsuccessful sieges, in which 52,900 troops were engaged, our loss in killed was 27 per 1000, and we had 90 per 1000 wounded ; so that our total casualties were 117 in the 1000.

I will now place these five groups of figures together, in the order of total casualties, beginning with the lowest :—

				Killed.	Wounded.	Killed and Wounded.
1. Successful sieges, terminated by capitulation	...	...	8	...	34	42
2. Offensive battles	...	...	12	...	62	74
3. Unsuccessful sieges	...	...	27	...	90	117
4. Defensive battles	...	...	24	...	110	134
5. Successful sieges, terminated by assault	...	...	38	...	122	160

The general result for all these military operations in which 539,105 soldiers were engaged (the same men, be it understood, having fought in more than one battle or siege), is expressed by these figures :—

21 per 1000 killed.

90 per 1000 wounded.

In all 111 casualties.

We approximate to the truth if we state the immediate results of military operations at 2 per cent. killed, 9 per cent. wounded, and 11 per cent. total casualties.

Of course, all the figures I have given were very largely exceeded in individual instances. Thus, the offensive battle of New Orleans (which was an attack on earthworks mounted with cannon and defended by practised riflemen), cost us 317 per 1000 casualties; and Albuera (numbered among defensive battles), the still higher figure of 395. St. Sebastian was taken by assault, with a loss of 313 per 1000 *hors de combat*; and we were repulsed from Bergen-op-Zoom, after having 272 per 1000 killed or wounded.

It may be interesting to add that, in the unsuccessful assault on Sebastopol, Oct. 5th, 1854, we had 179 in the 1000 put *hors de combat*.

The figures I have just given show the immediate

results of military operations. But to understand the full effect of warlike conflicts we must add to the killed one eighth for the victims of severe injuries, or the operations they rendered necessary. With this correction, the figures will stand thus :—

			Per 1000.
Killed, or mortally wounded	...	...	32
Wounded	...	...	79
			<hr/>
Total casualties	...	...	111
			<hr/>

Having now spoken of the immediate and proximate results of military operations, I must next treat of the matter in which we are most directly interested, the relative mortality from injury and disease.

This is only to be ascertained for long periods of time, and from such returns as those of the Adjutant-General. Making use of these returns, Mr. Hodge has shown that the total annual casualties in action prior to 1812 did not exceed 4·38 per 1000, while the deaths from diseases amounted to 49·61, or very nearly 50 per 1000. So that the losses by sickness were eleven times as great as by all forms of mechanical injury. But subsequently to 1812, our losses by battle attained much higher figures, while those by sickness diminished. But of this more presently.

It may be worth while to observe in passing, that whereas in the six years ending 1808, our mortality through casualties in action was only 1·91, or less than 2 per 1000 of the deaths from all causes ; it rose to 7·30 or more than 7 per 1000 in the four years following 1808. In the first period, the deaths by casualties in action were in the proportion of about 1 to 20 of the deaths from all causes, while, in the second period of harder fighting the ratio became about 1 to 9.

I shall now make an attempt to give a more precise idea of the operations of war on land by selecting some

continuous record which shall be to the army what Trotter's General Abstract was to the navy. Need I say that I find what I want in Sir James Macgrigor's "Sketch of the Medical History of the British Armies in the Peninsula of Spain and Portugal," read to the Medico-chirurgical Society, June 20th, 1815, and published in an early volume of their transactions. Sir James, who had had large experience in many parts of the world, and had done good service in Egypt, after Corunna, and at Walcheren ; of whom the Duke of Wellington, writing in July, 1814, says that he was "one of the most able, industrious, and successful public servants" he had "ever met with" (a truthful tribute which, with equal justice, Sir James was in a condition to pay to his noble chief, who thoroughly appreciated the services of our profession, and treated Sir James as Lord Howe treated Trotter, with full confidence and effective support) had the medical superintendence of the Peninsular armies from December, 1811, to June, 1814, a period of two years and a half, or thirty months.

In this period 346,108 cases of disease or wounds were treated in the hospitals, of which 232,553 were discharged cured ; 4586 were invalided, or sent to England for the recovery of their health ; and 18,513 died, including many hundreds who did not live one hour after they were first seen. The death-rate was 53 per 1000, which under the circumstances Sir James thought "*very small*."

Sir James begins by dividing the thirty months into four periods of active campaigning, which consumed about twenty months out of the thirty.

1. The *first* was a winter and spring campaign of five months, from December, 1811, to April, 1812, with the capture of *Ciudad Rodrigo* and *Badajos* for its fruits ; a period of hard work and great exposure, and, as the

result, 5000 wounded in hospitals: frost-bites, and tetanus, catarrh, cynanche, pneumonia, rheumatism, ague, continued fevers, and contagious typhus.

2. The *second* was a summer and autumn campaign of six months (from June to November, 1812), of which the great event was the victory of Salamanca. The health of the men was greatly tried by the retreat into Portugal, and alternate exposure to great heat, rain, and frost. And now dysentery, the scourge of armies, and hospital gangrene make their appearance, and there is a great mortality in the hospitals. Tetanus and continued fever are again mentioned, and remittent takes the place of ague. It is in the autumn months of September, October, and November, when febrile disorders are rife in Spain and Portugal, that dysentery and hospital gangrene show themselves.

3. The *third* of the four campaigns was like the preceding, a summer and autumn one (beginning with May, 1813). Its achievements were the victories of Vittoria and Pampeluna, the storming of St. Sebastian, and a footing in France. As a necessary consequence, we hear of many wounded, and of much tetanus; of dysentery, of hospital gangrene and contagious typhus, as bad as after the retreat from Corunna in 1809, of pneumonia, of agues, and remittent and continued fevers. There was great suffering from bad weather and transport by rough conveyances over bad roads, "but more from" the soldiers "own irregularities," for "the reports of the enormities and excesses committed by them were dreadful." But when the army halted, a strict discipline, a good supply of clothing and provisions, great vigilance of the medical staff, the establishment of regimental hospitals, and wholesome occupation for the soldiers, did much to restore the men to health. So that in August, "one of the most unhealthy months in the year in Spain," there was

an exemption from disease which Sir James attributes to "the healthy bracing air of the mountainous encampments at a distance from villages," the "moderate and wholesome labour" of the troops "in fortifying the passes," to the "abundance, and good quality of the provisions," "to the soldiers being excluded from the temptations to drunkenness and disorder," and "some-what," as Sir James thought, to the exhilarating view of the plains of France, and the thoughts of the coming campaign.

4. The *fourth* and last of the Peninsular campaigns opened, after a severe and trying winter in February, 1814, and ended at Bordeaux in May, a period of four months. The severe weather brought back the catarrhs, rheumatism, and pneumonia of the first campaign; ague, continued fever, and contagious typhus maintain their ground; yellow fever claims attention; and dysentery, cholera, and diarrhœa are prevalent; but though there are again "many wounded" and much tetanus, hospital gangrene proves much less fatal. Some of the diseases which afflicted the army were much increased in those who were embarked for England in transports. We are told that "hospital gangrene spread; cases embarked as *synochus* landed as *typhus*, and some assumed the appearance of *typhus icterodes*." The four months of this spring campaign were well spent in forcing the French army across the Nivelle, the Nieve, and the Adour, and in winning the battles of Orthez and Toulouse. Sir James says of this concluding campaign that the climate and seasons were favourable, that the troops suffered little from disease, and that the hospitals contained few besides the wounded.

This interesting and instructive account of thirty months of campaigning concludes with some tabular returns, showing among other things, the deaths and causes of death in all the hospitals, general and regimental,

excluding French prisoners, but including *extra patients*. The facts are arranged in years, so that to make even a rough use of them it is necessary to multiply the deaths and causes of death in the six months of 1814 by two.

This is what I learn from these returns by classifying the causes of death under a few heads.

I take first in order wounds and their consequences, and find a total of 950 deaths in 1812, of 1638 in 1813, and at the rate of 1864 in 1814.

Taking next dysentery (the scourge of armies) and its allied diseases diarrhoea and cholera, I find the deaths from these causes, in 1812, 2427; in 1813, 1767; in 1814, at the rate of 1578.

Fever, in its several forms, accounts for 3167 deaths in 1812, for 2788 in 1813, and at the rate of 1484 in 1814.

By diseases of the lungs, of which pneumonia and phthisis occupy the first place, we lost 114 in 1812; 216 in 1813; and at the rate of 384 in 1814.

The deaths from all causes were 7193 in 1812; 6866 in 1813, and at the rate of 5818 in 1814.

From these figures, taken one with another, I think we may infer that, in these three years, the losses by wounds and their consequences went on increasing, as did also diseases of the lungs; but that dysentery and fever, the two scourges of armies, inflicted upon us a rapidly decreasing rate of mortality.

If I correct these figures, as far as it is possible to do so, by taking into account the total strength of the Peninsular army in the month of January of each year, I obtain these results:—

	Per 1000.
Deaths by wounds and their consequences ...	19, 25 and 29
„ dysentery and the allied diseases ...	47, 27 „ 23
„ fever... ..	62, 42 „ 22
„ lung diseases	2, 3 „ 6
„ all causes	141, 105 „ 87

Sir James Macgrigor's paper abounds in interesting details and suggestive hints, and contains some brief and highly instructive numerical details.

Two facts of this order relating to recruits and old soldiers may well arrest our attention. In nine months (August, 1811, to May, 1812) the 7th regiment lost 246 men, the recruits at the rate 478 per 1000, the old soldiers of only 67 per 1000, a sevenfold loss on the part of the recruits. The 40th regiment in about the same time has 170 deaths, of which the recruits contribute at the rate of 231, the old soldiers at the rate of 59 per 1000, a fourfold loss on the part of the recruits.

Another fact mentioned by Sir James is well worth notice—namely, that regiments that had been at Walcheren suffered even more than recruits, and that the 91st Highlanders, which had suffered most of all, still retained a sallow and unhealthy look in January, 1814. This fine regiment, in the twenty months from October, 1812, to May, 1814, out of a total strength of 1703 (including 121 recruits), lost 220 men, and had fifty-six invalided; the deaths, therefore, being at the rate of 129 per 1000. But this high rate of mortality was far exceeded in the 1st battalion of the 1st regiment of the Guards. In the same period of twenty months it suffered the enormous loss of 674 men dead in hospital and had 280 invalided, out of a total (including 565 recruits) of 1965 men; being at the rate of 343 per 1000—considerably more than one-third in twenty months.

One other fact I must mention; and it is a fact repeated more than once. Sir James, speaking of the fatal fever which attacked the first division, but was confined almost entirely to the Guards, adds that the German regiments of that division were “among the most healthy corps of the army,” as he had uniformly seen them to be “on every service, particularly at Walcheren.” In another

place, he says, "The temperance, steadiness, and regular habits of the German legion kept them always in a state of health." And he adds, in a note, "The first German Hussars neither lost a man nor sent one to the general hospitals during the retreat from Burgos, nor till after the next campaign was opened, and we were advancing into France."

When I read this I must confess that I congratulate myself, as an Englishman, that hitherto it has been our good fortune to encounter as comrades, not as foes, these temperate, regular, steady, and brave men; and I cannot but think, that had the French nation borne in mind this formidable list of soldierly qualities, they would have hesitated to enter the field against the soldiers who, partly through the possession of these qualities, have inflicted upon it such great and irretrievable disasters.

We have heard much of late of military organization; let us not forget this lesson of temperance, steadiness, regular habits, and health as a natural consequence, when next we have occasion to lead our troops to battle. If we have not learnt it, and German troops, with these old soldierly qualities and the new organization to back them, shall chance to be our foes, not even the unsurpassed bravery of British soldiers can save us from defeat.

The campaigns in Portugal and Spain naturally claim the first place in the history of our twenty-two years of warfare, on account of their long duration, the momentous issue involved in them, and the signal triumph with which they were crowned. But the expedition to Egypt (especially if we consider it as the sequel of the victory of the Nile, and Sir Sydney Smith's gallant defence of Acre) though of short duration and subordinate importance, has peculiar attractions of its own. Fought in a land as remarkable for its ancient civilization and rare fertility, as for the many scourges to which it has always

been subject, it is hard to say whether it abounded most in the elements of the romantic and picturesque, in facts bearing on the defence of our Indian Empire, or in experiences affecting the solution of great sanitary questions. It is to this expedition that I now invite your attention, assisted by the histories of Wilson and Walsh, and the brief medical record of the same James Macgrigor to whom we have been indebted for so much information on the peninsular campaigns.

We made our attack on Egypt for the expulsion of the French with two bodies of troops, of which the one acted from the coast of the Mediterranean, the other from the direction of the Red Sea. To the former fell the honour of conquest, to the latter the credit of most effective, though somewhat tardy, co-operation.

By the 1st of January, 1801, the force which was to invade Egypt from the side of the Mediterranean had mustered in Marmorice Bay; and, after being exposed for two days and nights to "the most violent thunder and hail-storm ever remembered," set out on their perilous expedition on the 23rd February, and on the 2nd March the fleet of 175 sail anchored in Aboukir Bay, the men of war riding where the battle of the Nile had been fought. On the 8th of March, a military force, estimated by Sir Robert Wilson at 12,000 effective fighting men, was landed, and won the battle of Aboukir, at a cost of 666 men, killed, wounded, and missing. In the advance, which occupied the interval from the 13th to the 18th, and involved us in a series of sharp encounters, we sustained a further loss of 1154; and at the decisive battle of Alexandria, fought on the 21st, when Abercrombie was mortally wounded, 1334. From this date to the 1st of September, when the surrender of Alexandria crowned the labours of the expedition, our loss in killed and wounded reached the low figure of 147. So that, with a

total loss of 3301 men (505 killed, 2723 wounded, and 73 missing), out of a force estimated at 12,000 effectives, we succeeded, in the short space of less than six months, in destroying, taking prisoners, or compelling the surrender of 32,180 French troops, who, with a civil establishment of 768 souls, made up the total of the French that occupied Egypt. If we add the deaths from disease to the casualties from actual fighting, we have still a great result, achieved at a small cost of life.

The force which assailed Egypt from the direction of the Red Sea consisted of Europeans and native Indians, in nearly equal proportions. The European troops, collected from the garrison of the Cape and from the several Indian presidencies, had an effective strength of 3759. The natives, brought together from different parts of India, numbered 4127. The total force of 7886 was landed at Cossir Bay, in three divisions, on the 16th May, 1801, the 19th May, and 4th June respectively.

This expedition to Egypt, then, afforded a rare opportunity of noting the effect of climate on the health of troops. One body of Englishmen direct from home, another collected from India and the Cape, and natives from every part of India, were made to undergo the fatigues of military life in a climate contrasting strongly with their own—the Europeans from India, exposed to tropical heat in crossing the Desert; the Indians gradually transferred to the cold shores of the Mediterranean, and both brought face to face with the plague and the ophthalmia.

Let us see what instruction we can glean from the histories of Wilson and Walsh on the one hand, and from the Medical Sketches of Sir James Macgrigor on the other; the one, be it recollected, having reference mainly to the European force which landed with Abercrombie at Aboukir Bay; the other to the mixed force of

Europeans and native Indians that disembarked at Cossir.

The most definite, and therefore the most valuable, information to be drawn from the two military histories is to be found embodied in tables showing the state of the army of Egypt at different periods of its progress, first under Abercrombie, then under Hutchinson. There are four such tables available; and they all present us with figures, stated in detail, of the men who, at the several periods referred to, were fit for duty, or incapacitated by sickness, distinguishing these last as present and absent. I have submitted the facts recorded in the several tables to calculation, and will now briefly state the results :—

1. When the troops were mustered at Marmorice Bay, on the 21st February, 1801, they numbered 16,599 rank and file; of whom there were sick (present and absent), 1704.

2. On the 7th March, the eve of the landing at Aboukir, out of a total of 14,954 rank and file, there were 1654 sick (present and absent).

3. At the camp before Alexandria, March 30, nine days after the battle, out of a total of 15,463 rank and file, there were 4264 sick (present and absent).

4. At the same spot, on the 13th September, Hutchinson had under his command, 19,647 rank and file, of whom 4938 were sick.

It will be seen, then, that if we limit ourselves to the rank and file of the infantry in every case, we obtain as the result of somewhat less than seven months of active operations, a sick-list of 102 per 1000, at Marmorice Bay; increased to 110 per 1,000 prior to the landing at Aboukir; further augmented to 276 per 1000 after the battle of Aboukir, the onward disputed march to Alexandria, and the battle of Alexandria itself; and, finally falling to the lower figure of 251 per 1000 at the end of

the campaign, when part of the Indian force had joined and the fighting had ceased.

The tables in which these figures are embodied enable us to throw light upon a point I have not yet touched upon: I mean the relative liability to sickness of different branches of the service. These are the figures obtained from the "State" of the troops in the camp before Alexandria:—

	Per 1000.
Sick in the infantry	276
„ „ artillery	178
„ „ cavalry	107
„ „ gunner drivers	183

These figures which, with the exception of the last, are obtained from a sufficient number of facts, are in keeping with calculations based on the other returns. So that we may take it as a rule that, in warfare, the cavalry suffer least from sickness, the infantry most, while the artillery occupy an intermediate position.

I may yet have to refer to Sir Robert Wilson's history for some illustrations of disease and its causes; but, meanwhile, I will present to you as condensed an account as I can of the diseases and mortality that befell the mixed contingent of European and Indian troops which landed at Cossir at the dates already given—an account furnished from the most trustworthy official sources, by James Macgrigor, A.M. (better known, in after times, as Sir James Macgrigor), "head of the medical department of the army from India," and "member of the Board of Health in Egypt."

As the Indian army arrived in Egypt too late "to share in any other dangers than those arising from the diseases of the country," we have here an account of the effects of war divested of the incident of fighting, but of warfare in the birthplace of plague and ophthalmia.

In studying the plague, the author had the advantage of referring to the experience of Dr. Buchan and Mr. Price ; of whom the former had charge of the pest-house at Aboukir, and the latter possessed an unusual amount of learning, and both had experience of the disease in their own persons.

The army from India landed at Cossir, on the western coast of the Red Sea, and entered Egypt by the old commercial route over the desert of Thebes. All the troops were assembled there early in the month of June, 1801 ; and, having recovered from the diarrhoea caused by drinking water containing much sulphate of magnesia, and become accustomed to this new beverage, were "uncommonly healthy." This, their healthy condition, was in great measure due to the wise sanitary measures adopted during the long confinement of six months on board ship. All the men selected for the service were in a healthy state, the transports were large, lofty, and roomy, supplied with good water, stocked with fresh provisions and vegetables, rice, pickles, spices, and tea ; with wine, fermented liquors, and every other comfort for the sick. Good regulations were established on board all the ships, and rigidly enforced. One ship (the *Minerva*) sailed from Bombay "much crowded," and in a three weeks' passage to Ceylon had much sickness and several deaths on board ; but three ships having been substituted for one, not a man died in the *Minerva* during the three months' passage to Cossir.

In Sir Robert Wilson's account of the contingent from India we encounter a passage which shows that the old enemy of the soldier and sailor, the jail distemper, had not been conquered. He tells us that certain companies of the 61st regiment of Europeans were detained at the Cape, in consequence of the jail fever having broken out in the ships *Sheerness* and *Wilhelmina*, which

brought out the 68th regiment, composed chiefly of boys, of whom the distemper carried off a great number, being also fatal to many of the sailors. These ships were made so healthy by cleansing and fumigation that 900 soldiers, after being nearly sixteen weeks on board, arrived at Cossir without a single sick man.

Clothing of white cotton during the hot weather, warm clothing in the cold season, bathing enforced wherever practicable, the diet in the case of the European troops made to conform as much as possible to that of the Hindoos, light Greek wines in the warm season and spirits in the cold, and for the native troops (whose prejudices were happily overcome) a portion of animal food and wine during the cold weather; these were the appliances with which the men were furnished whose first duty it was to cross a desert amid intense heat, hot suffocating winds, and storms of dust. "The fatigue on the march has, perhaps, never been exceeded in any army," and yet they reached the banks of the Nile, having had only some diarrhoea, and a few cases of ophthalmia and nyctalopia. During the greater part of July the army encamped on the banks of the Nile; but at the end of the month were embarked in boats, and by the 12th of August, after a navigation of nearly 400 miles, they arrived at Ghiza. During this voyage several cases of inflammation of the liver and of the lungs, of dysentery, fever, and ophthalmia, occurred, but mostly recovered on the passage; and the troops landed with a few cases only of slight fever. And now the soldiers began to be very sickly. In the first week, from a twelfth to a tenth of the force were in hospital; in three weeks the sick exceeded a thousand; and by the end of the month twelve hundred were embarked at Rosetta. The prevailing disease was a fever lasting two, three, or at most, five days, and rarely fatal. But there were many cases of ophthalmia, and

some of hepatitis and dysentery. On the 14th September, the first case of plague was recognised, and others soon followed. From this time the disease continued to show itself, in spite of very efficient measures of isolation and purification, till in January of the year following the number of attacks reached 72. In February it fell to 21, rose in March to 46, and in April again fell to 26. Part of the army marched to Alexandria in December, 1801, and all, with unimportant exceptions, were there in January, 1802. In May, they were on their return, crossing the Desert of Suez; and early in June, embarked for India, with the exception of one regiment, in which the plague still prevailed. Among the troops that embarked there was "hardly a sick man;" and when the one regiment that remained behind was inspected, prior to its embarkation, there were only four sick of colds. All the troops arrived safe at their several destinations.

It will be interesting to inquire at what cost in sickness and loss of life this expedition to the classic land of plague and ophthalmia was carried out. If we take the 1200 sick to which allusion has just been made as the maximum of sickness, we have a sick-rate of 152 per 1000; and if we sum up the figures in a table given of the deaths, and causes of death, in the Indian army, from the time of embarkation for Egypt to their re-arrival in India, we have a death-rate for the European troops of 82 per 1000, and for the native troops of 95 per 1000. But as the number invalided among the former amounted to 31 per 1000, and among the latter to only 10 per 1000, it is probable that the final death-rate did not differ materially in the two bodies of troops.

But the causes of death were very differently distributed among the two. For while the plague killed only 10 per 1000 of the Europeans, and fever 5, the first destroyed 31, and the second 22, among the native Indians. But,

on the other hand, while 17 per 1000 of Europeans died of liver-disease, and 39 per 1000 of dysentery, the deaths from the same causes among the Indians were 3 and 11 per 1000 respectively. Under the head of casualties and diseases unknown, there is an entry of 11 per 1000 for Europeans, and 22 per 1000 for natives.

It is true that the cases of Europeans and natives are not strictly comparable, because the average time that the former were on service was somewhat more than nine months, while it was nineteen months in the case of the natives. And if we reduce the figures in each case to the common standard of a year, we obtain for the European troops a death-rate of 109 per annum; for the natives the much lower rate of 60. If we deal in the same way with the causes of death, we find that while the plague destroyed our European troops at the rate of 13 per 1000 per annum, it killed 20 per 1000 of the natives; while fever proved fatal to 7 of the one and 14 of the other. On the other hand, diseases of the liver were the cause of death in 23 Europeans per 1000, and only 2 natives, and dysentery in 52 per 1000 of the one and 7 of the other. The mortality from casualties and diseases unknown was nearly equally divided between the two classes of troops.

If, now, we take into account that the European troops were invalided at the rate of 41 per 1000 per annum, but the natives at the much lower rate of 6, it must be obvious with what advantage and economy of life native troops may be employed in such a country as Egypt, provided their fighting qualities are up to the required standard.

Let us now see what can be learnt respecting the plague from Macgrigor's "Medical Sketches," over and above what Dr. Hodges taught us about it as it occurred in London in 1665.

Let us take the symptoms first. Hodges knew that

the fever of the plague assumed different types. In some patients it was continued, in others remittent, and in others, again, intermittent. Macgrigor was cognizant of this fact, which, however, struck him as a new feature in the history of the disease. In the cold season the fever was inflammatory, it was typhoid in patients brought out of crowded hospitals, of a mild form when it was about to disappear for the season. In some exceptional cases there was no fever.

Delirium was as common in Egypt as it had been in London ; and tremors of the arms are mentioned as a most characteristic symptom.

Buboes were very general, but not universal, and they often showed themselves in from four to six hours after the first appearance of indisposition.

Most of the complications witnessed in Egypt were those which Hodges saw in London. There were distressing bilious vomiting and obstinate costiveness, diarrhoea and dysentery, pneumonia and pleurisy, and comatose symptoms, sometimes from the first.

Sudden deaths were as common in Egypt as they had been in London. They often occurred most unexpectedly during convalescence ; and there were some in whom the least change of posture proved fatal.

Macgrigor had as little doubt that plague was contagious as Hodges had ; but there was among the staff of doctors and surgeons one who seems to have sacrificed his life to his scepticism. I say *seems*, because he was exposed to the same danger as his twelve colleagues, of whom six caught the disease, and four died ; but, as he fell ill soon after inoculation, it is likely that that was in him the true cause. It was on the evening of the 2nd January that he rubbed bubonic matter into his left thigh, and on the following day inserted it into a wound in the right fore-arm. On the evening of the 6th,

he had shiverings and febrile symptoms, which he took for ague ; on the morning of the 7th he was better, but in the afternoon of the same day, after half an hour of rigors, followed by a profuse sweat, pain in the head, tremors of the arms, and other characteristic symptoms showed themselves, and on the afternoon of the 9th he died delirious.

The latent period, like the duration of the malady, was very various. Cases are given of ten and seventeen days.

Concerning the treatment we learn that Dr. Whyte used the lancet very freely, but that every one of his patients died ; that Macgrigor himself had little to boast of in his treatment of some cases ; that Mr. Price thought well of citric acid, with which, and baths of strong vinegar, he thought he had cured some Arabs ; but that the place of honour belonged to mercury, given so as to affect the gums. Macgrigor, judging by reports of cases which he inserts among his sketches, had some reason for looking upon this form of treatment as holding out "a prospect of success the most encouraging." But, in addition to the difficulty we must always have in judging of the relative success of treatment in all epidemics, through the varying severity which marks their onset, meridian, and decline, we cannot resist the suspicion that the susceptibility to the action of mercury in the cases in which it shows itself, marks those milder and more tractable cases that would have recovered had no mercurial preparation been administered.

But if we must needs speak doubtfully about the cure of the plague, we need not hesitate to give credit to the authorities for the preventive measures which they brought to bear upon it. "If," says Macgrigor, "in the treatment of the disease, we were not successful, we assuredly were completely so in the prevention. At

length this became so generally known, that we no longer heard the distressing accounts of despondence and despair among the natives." He is speaking of the native troops from India who began by abandoning themselves to despair, but ended by furnishing volunteers for duty in the pest-houses.

The preventive measures adopted with such success are embodied in General Baird's order to the army, and it may be well that I should briefly state what those measures were.

1. To every hospital, an observation-room, or a tent, was attached, and to it every case with febrile symptoms was sent, as soon as they were discovered, to be there most strictly watched by the surgeon.

2. On any symptoms of the plague appearing, the case was instantly sent to the pest-house from this room or tent, accompanied by the surgeon who had attended it, that he might give to the medical attendant at the pest-house an account of the treatment previously adopted. If there was any doubt about the case, the patient was placed in the observation-room of the pest-house; and if the disease did not turn out to be plague, he was sent to the quarantine.

3. Every corps and department was minutely inspected by the surgeon twice a week; and every person having the least appearance of ill-health was sent to the hospital.

4. Every corps or hospital where the case of plague occurred, was put into quarantine, and such corps or hospital was inspected by the surgeon, at least two or three times a day, and every case with suspicious symptoms was ordered to the observation-room.

5. In suspected corps, bathing was enforced frequently and at stated periods, and their clothing and bedding were frequently washed and baked. To all the hospitals ovens and smoking-rooms were attached.

6. Quarters, hospitals, and camping grounds were frequently changed.

7. Nitrous fumigation was constantly practised. Lamps used for this purpose were kept constantly burning in the observation-rooms, and in those from which the plague cases had come. Vessels containing materials for the fumigation were also placed under the beds, and in the corners of the rooms. When the stock of nitre was exhausted, marine salt was substituted for it.

By means such as these the plague, which was deemed to have been very prevalent in the season that ended June, 1801 (the period from November or December of one year, to June of the following, being the recognised cycle of the disease), was so held in check, that it proved fatal to only 38 European, and 127 Indian soldiers.

That the season of 1801 was a bad one for the plague, may be inferred from certain statements to be found in Sir Robert Wilson's history. The Mamelukes, he tells us, had suffered severely, sixty thousand people having died of the plague in Upper Egypt, while forty thousand were attacked by it in Cairo; and he learnt from an intercepted letter written by General Belliard, that, in six days, one hundred and fifty soldiers had died of the plague in Cairo, and his wife and three servants in forty-eight hours. We also learn that the disease raged so violently at El Arish, as to reduce the native Egyptian garrison of 4000 to 1500 in less than a month.

Of the mortality inflicted by the plague and by other diseases on the British army that landed at Aboukir, we have no accounts in the works of Wilson and Walsh; but there are many allusions to the excessive prevalence of sickness among the troops.

On one point of special interest in reference to the plague, and the causes which produce and promote it,

we have less information than we should expect in Macgrigor's "Medical Sketches," and what little there is to be found in a single passage to the effect that "the structure of their houses, and the plans of their streets are calculated for the production of disease, and the preservation and concentration of contagion."

But Sir Robert Wilson happily supplies any possible shortcoming in this respect. He tells us that, "a Turkish market-place is sufficient to generate a plague;" that "it is never cleaned;" that one layer of blood lies upon another; that the scene is indescribable.

In speaking of the city of Rosetta, he says: "the streets are not more than two yards wide," that they are infested with "filth, mosquitoes of the most dreadful sort, vermin of every kind," with "stench intolerable," and "houses almost uninhabitable;" that uncleanness so prevailed in the very baths, and the passages leading to them, as to make "the air so tainted and oppressive," that English visitors turned back in disgust. The French, however, seem to have had stronger stomachs; for Sir Robert styles this very Rosetta, "Savary's Garden of Eden." The inhabitants of this charming spot seem to have been quite in keeping with the place itself. The quantity of blind was prodigious, nearly every fifth inhabitant had lost his sight, or had some humour in the eyes; erysipelas, dropsy, leprosy, elephantiasis, contortions, and *lusus naturæ* of every sort abounded, and the women were so ugly that the writer deemed it fortunate for Europeans that they concealed their faces by black cloth veils with two holes only for the eyes.

Of the misery of an Egyptian village Sir Robert conveys to us a very lively idea by describing an Irish hut as a palace compared to the sties of which it is made up. "Each habitation is built of mud, even the roof, and resembles in shape an oven." It consists of "only one

apartment, generally of about ten feet square. The door does not admit of a man entering upright ; but as the bottom is dug out about two feet, when in the room an erect posture is possible." "Here a whole family eat and sleep, without any consideration of decency or cleanliness." These villages are not improved by being surrounded with high mud walls.

Lastly, Sir Robert gives an account of the state of the camp of the army of the Grand Vizier, at Balbeis, which is in perfect keeping with what I have just told you of the condition of markets, houses, villages, and towns. It was a "disgusting chaos," with dirt and filth enough "to generate the plague, and every pestilential disease." For one example of perverse and fantastic nastiness, reference must be made to a note at p. 116 of Sir Robert's history.

Such then, so late as the first year of this century, was the condition of the country and people from which the plague was never absent ; and not very unlike it, not very much raised above it, was the state of the plague-haunted metropolis of England when the great fire destroyed it.*

There is much more connected with this double expedition to Egypt which, if time permitted, I should be glad to notice, and especially the "resolution, patience, and spirit," with which our soldiers bore all the exposures of a most trying climate. This may have arisen in part from the fact that "frequently they were obliged to drink only water," that, "never, indeed, had an army before been so abstemious, and consequently so well conducted."

* In speaking of the plague in my fourth Lecture—See "Public Health," Part I., p. 83—and again in this, I have not yet noticed, as I ought to have done, the valuable information relating to the plague to be found in that section of John Howard's works which treats of Lazarettos.

With these suggestive words I pass from this necessarily brief record of an admirably managed and most successful campaign to that painfully instructive contrast, the fatal expedition to Walcheren in 1809.

This expedition had for its objects the capture or destruction of the enemy's ships building at Antwerp and Flushing, or afloat in the Scheldt, the destruction of the arsenals and dockyards at Antwerp, Terneuse, and Flushing, the reduction of the island of Walcheren, and, if possible, the rendering the Scheldt no longer navigable for ships of war.

With these important objects in view, a mixed armament of soldiers and sailors to the number of about 70,000, of which the military force alone numbered about 42,000 (the largest expedition, I believe, that ever left our shores), anchored near the coast of Walcheren on the 28th and 29th of July. On the 30th Sir Eyre Coote landed with 12,000 men, other landings soon followed; on the 13th August Flushing was bombarded, and on the 15th it capitulated.

The bombardment had the effect of seriously injuring the buildings in which our troops had to be accommodated, so that some of them lay in cold damp churches, without beds, with their great coats for covering, and their knapsacks for pillows, while the hospitals were warehouses into which light and air were admitted only through iron gratings.

On the 20th August sickness began to show itself among the troops in South Beveland, the sick numbering already 1564. On the 23rd the sickness greatly increased, and augmented so rapidly that by the 26th of the month no less than 5000 rank and file were ill.

On the 27th, a council of war decided that the siege of Antwerp was impracticable; so that thus early in the day sickness had frustrated the ultimate and chief object

of the expedition. By the 28th of the month many officers had been seized with fever. The report for the 31st was "sickness still increased," and the officers of the medical staff suffering much. On the 1st of September, in spite of the constant removal of troops, sick and sound, the sick list numbered 5000, on the 3rd, 8194, and on the 7th, 10,908. On the 10th, 7396 sick still remained in Walcheren. From this date to the 23rd December, when the evacuation of the island of Walcheren was completed, the history is one of sickness and of that only.

At this point, which we have reached under the guidance of Mr. Marshall,* I turn for a summary of results to one of Mr. Hodge's tables, compiled with his usual care and minuteness. It appears that, on the average of the ten weeks (from September 19th to November 28th), the officers suffered from sickness at the rate of 166 per 1000 of main strength, and the rank and file of 470 per 1000; that the sickness of the officers attained its maximum of 307 per 1000 as early as the week ending the 17th September, and fell progressively to a minimum of 78 per 1000 on that ending November 28th, but that the sickness of the men was at its maximum of 587 per 1000 in the week ending October 8th, and fell to 155 per 1000 in that ending November 21st.

If from this sad account of sickness we turn to the mortality, and to that column which shows the equivalent annual destruction of life, we find the officers perishing at the mean rate of 181 per 1000 (the maximum occurring in the week ending September 17th), while the rank and

* "Contributions to Statistics of Sickness and Mortality which occurred among the Troops employed in the Expedition to the Scheldt in the Year 1809." By Henry Marshall, Deputy Inspector-General of Army Hospitals (Edinburgh Medical and Surgical Journal, No. 133).

file died at the astounding rate of 640 per 1000 on the average (the maximum of 910 per 1000 being recorded for the week ending September 24th). The lowest rate for the officers was 88 per 1000, for the men 235.

The average of 640 per 1000 has perhaps never been exceeded in warfare ; for the rate during the worst seven months of the Crimean campaign is stated by Mr. Hodge at 600.

We obtain a very vivid idea of the sickness and mortality to which our troops were subject in this ill-fated expedition, from a return of the sick admitted into the general and regimental hospitals in the eastern district of England, from corps employed in the Scheldt. The sick numbered 17,536, of whom 914 died ; the death-rate being a maximum of 1 in 5 among the worst cases, a minimum of 1 in 30 among the mildest, an average of 1 in 19.

From a return, laid before the House of Lords, it appears that between January 1st and June 1st, 1810, there were admitted into hospital, from the corps which served in Walcheren, 36,000 patients ; and from another return submitted to Parliament, 10,000 men were sick, and 2000 died during the time that the Ministry were debating whether Walcheren should, or should not, be retained. The total loss of life has been set down at 8000, and the cost in money at twenty millions, or nearly one million in taxes for every year of the war. Need I tell you that the Expedition landed the troops in a swamp, where the inhabitants were known to be very liable to fever, to have an unhealthy aspect, and to suffer a rate of mortality in excess of that prevailing in the marshy parts of some of our English counties ; need I add that the effect of the climate on the health of strangers was known to be most disastrous ; that a Scotch regiment in the Dutch service had been known to bury their whole num-

bers at Sluys, in Dutch Flanders, in three years ; that the same rate of mortality prevailed among the French, and among a native Dutch regiment, of whom we found a remnant of 85 men, the survivors of 800 landed in Walcheren only three years before? It was, then, to this swamp, notorious for the unhealthiness of the natives, and a destruction of life among foreign soldiers at the rate of a whole regiment in three years, that we sent out our brave men to perish. Can we wonder that Napoleon was rejoiced to see his redoubtable foes, always so hard to conquer in open fight, “packed in the morasses of Zealand ;” or that the French “crowed over the expedition with the force of reason, the bitterness of sarcasm, and the playfulness of ridicule ?”

The account I have just given you of the successful expedition to Egypt will serve to suggest at least this reflection, that it is better far to expose an army to the plague, which, being contagious, may be kept in check by obvious methods of precaution, than to land it in a swamp where the air is filled with a poison against which there is no protection, and no safety but in flight.



LECTURE XII.

SANITARY PROGRESS.

HAVING in my last two lectures treated of the losses inflicted by disease, and the disabilities entailed by sickness, first on our navy and then on our army; I proceed to compare, in these respects, the one service with the other, speaking first of deaths by disease compared with casualties in fighting, and then of sickness taken by itself.

Let us begin by supposing 1000 sailors to have been engaged in the various operations of naval warfare as carried on from 1793 to 1815: they would have had 20 killed and 60 wounded, or 80 casualties in all. But if we substitute soldiers for sailors, and suppose them also to have been employed in every kind of military contest, the 1000 soldiers would have sustained a loss of 21 killed in lieu of 20, and 90 wounded in lieu of 60, making in all 111 casualties in place of 80.

If we class the results of actual fighting under the three heads of mortally wounded, not mortally wounded, and total casualties, we get for the navy the figures, 28, 52, and 80; and for the army 32, 79, and 111. But, as already stated, the actions between single ships, which have no parallel in any military operations, are exceptionally destructive. We ought, therefore, to compare the actions between fleets, or squadrons, on the one hand, with land battles on the other; and naval attacks

on land defences with their nearest analogues, siege operations.

The first of these comparisons yields the following results:—Our leading naval engagements, in which an aggregate of 92,180 sailors were engaged, caused a loss in killed of 17 per 1000, in wounded of 51 per 1000; or 68 per 1000 of total casualties. Our principal land battles, fought by an aggregate of 402,405 soldiers, issued in a loss per 1000 of 19 killed (in lieu of 17) and 88 wounded (in lieu of 51); giving, as total casualties, 107 per 1000 (in lieu of 68).

The second comparison, or that between naval attacks on land defences and military sieges (21,651 sailors being engaged and 137,300 soldiers), yields the following figures:—Naval attacks, 26 per 1000 killed, and 57 wounded, total casualties 83 per 1000. Military siege operations, killed 30 (in lieu of 26), wounded 94 (in lieu of 57), total casualties, 124 (in lieu of 83).

These, be it recollected, are average results, applicable to a succession of varied operations by land and sea, but certain to be very largely departed from, in the directions both of excess and defect, if we limit our comparisons to single analogous operations. If, for instance, we were to compare the naval engagement at Genoa fought by Lord Hotham with 8810 sailors, with Albuera, which Beresford fought and barely won with 9000 soldiers (the numbers being, therefore, nearly equal) we should find that, while we lost 71 sailors, and had 266 wounded, or a total of 337, we lost no less than 882 soldiers, and had 2672 wounded, or a total of 3554. So that the casualties in the naval engagement were at the rate of 38 per 1000, while those in the land battle amounted to no less than 395 per 1000, or more than ten times as many.

On the other hand, if we compare the great victory of Trafalgar with the victorious military operations of

Corunna, and Ciudad Rodrigo (the numbers of men engaged being respectively 16,826, 16,700, and 16,600), the total casualties are found to have been 100 per 1000, or exactly 10 per cent., at Trafalgar; 47 at Corunna; and 60 at Ciudad Rodrigo. In this case, though the two military operations conform to the rule, inasmuch as the siege is more destructive than the battle, the rule is transgressed which makes the naval engagement less destructive to life than the military.

I have yet to compare the deaths from disease as they occur in the navy and army respectively. In other words, I have to bring together and place side by side the figures referring to the two services which I have already submitted to you. In the navy, as I have stated, the deaths by disease are nearly seven times as numerous as those that result from actual fighting. But in the army, the mortality from disease is no less than eleven times as great as that inflicted by fighting.

Disease then, as a cause of death, levied a higher toll on the soldier than on the sailor, in the proportion of 11 to 7; levied it, that is to say, during part of the long war that terminated in 1815. A larger and longer experience might, of course, alter these ratios; but it would, I believe, remain a general truth that the naval service proves less destructive to life than the military.

The loss sustained by officers and men respectively, in battle and by disease, is a point of some interest. In the navy, in consequence of a want of information respecting the relative numbers of officers and men exposed to risk, Mr. Hodge was unable to ascertain the true figures. But with the army he was more successful. He found that during the whole period of the war, from 1793 to 1815, the officers died at the rate of 7.06 per 1000, the non-commissioned officers and rank and file, of 6.60; while the annual ratios of casualties to the 1000 were

30·19 and 22·88. This excess of injuries in battle sustained by the officer is, however, more than compensated by his better accommodation in quarters and in hospital, and his less liability to attacks of sickness.

I cannot show this comparative immunity of the officer from sickness, and mortality arising out of it, better than by taking that one among the weekly returns of the sick and dead in the fatal expedition to Walcheren, which shows the largest mortality among the officers. It is the week ending September 17th. The sickness among the rank and file was at the rate of 468 per 1000; the deaths 16, or 1 in 29 of the sick; while among the officers the sick numbered only 307 in the 1000, among whom 9, or 1 in 34, died.

Of sickness, as a means of diminishing the number of fighting men in navy and army respectively, I have no figures to bring forward which you would accept as showing the relative liability to sickness of the two services. Trotter's census of April, 1794, to which I have already referred, shows for Lord Howe's fleet a ratio of 33 per 1000, and this must be considered a very favourable ratio, seeing that the daily sick-rate for the home station, in the year of peace, 1868, was nearly 38 per 1000. In the whole army, for the same year, 1868, the "constantly non-effective from sickness," if taken to mean the same thing as the "daily sick-rate" of the navy, was 47 per 1000, while the figure for the whole navy was 48. The death-rates were, for the navy, 89 per 10,000, for the army, 148 per 10,000.

Against the 33 per 1000 of sick in Lord Howe's fleet, in April, 1794, I have no army return to adduce which shows any approach to these favourable figures.

The most favourable return of sickness I have come across is to be found in Walsh's "Journal of the late Campaign in Egypt." The troops mustered in Marmorice

Bay had 84 in the 1000 sick, but the ratio rose to 103 and 110 per 1000 after the landing in Egypt, and, in the army under the command of Hutchinson, which finished the work that Abercromby began so well, the said army having advanced into Egypt, the sick-rate reached the high figure of 261 per 1000.

The lowest figure for our troops in the Peninsula was 94 per 1000 on the 22nd April, 1809. It was 97 on the 1st of May. It reached its maximum in October, 1811, when it was 330 in the 1000. In the Walcheren expedition the sick-rate ranged from 155 per 1000, for the week ending November 21st, to 587 per 1000, for the week ending October 8th. The average was no less than 470 per 1000, that of the Peninsula being 209, and of Egypt 182. I have referred to Sir James Macgrigor's "*Medical Sketches of the Expedition to Egypt from India*," in the hope of finding some returns of sickness in a body of troops, the lesser half of which consisted of Europeans serving at the Cape and in other colonies, and the greater half of natives of India; but I have been disappointed. This little work, however, contains some details of mortality chiefly caused by dysentery, liver-disease, plague, and fever; and to these I referred in my last lecture. I may here repeat the statement that the mortality among our European troops was at the rate of 82 per 1000 per annum, and among the natives of India, 95 per 1000; the death-rate in the Duke of Wellington's Peninsular army, during forty-one months, having been at the higher figure of 109 per 1000 per annum.

If we would know what sickness of the more severe order may do to thin an army, we must go to the records of individual regiments, such as the first battalion of the 1st regiment of the Guards, which served first at Walcheren, then in the Peninsula. From facts stated by Sir James Macgrigor, it appears that that fine regiment

suffered a loss, in twenty months, equivalent to 206 per 1000. But this mortality of one-fifth is cast into the shade by a calculation of Mr. Hodge, which assigns to our ill-fated army in the Crimea a loss, in seven months, at the rate of 600 per 1000 per annum—a loss, to find a parallel for which we must look to the experience of our armies under a tropical sun, or in the West Indies, to which, as Robert Jackson tells us, several newly recruited corps were sent out during the war that preceded that of the French Revolution, with this result, “that though not a man died by the sword, yet, in the short space of two years, there scarcely was a soldier left.” This most painful statement, respecting the Crimean War, forms a fitting climax to the little that I am able to say on the subject of sickness as a means of diminishing the number of our fighting men—of impairing the efficiency of our fleets and armies.

I now pass on to that topic which I reserved for this, my last lecture : the means by which the loss of life that war entails, whether by land or sea, in actual fighting, or by disease, has been lessened ; taking note especially of those inventions and discoveries for which society is indebted to our own profession. To exhaust this branch of my subject, a short course of lectures would be necessary ; but I hope to give, in this one lecture, an outline of it which others, with the advantage of fuller technical knowledge, may be tempted to fill up.

If I were writing a complete treatise on the alleviations of which the state of war has proved to be susceptible, I should be disposed to divide it into several heads, among which I may indicate the following :—

1. That slow and insensible improvement in the thoughts and tempers of mankind, which has led to the abandonment of such wars of extermination as were once waged under the pretence of divine authority, or

the cloak of religious zeal ; and the condemnation, at least, of those wars of conquest that were prompted by personal craving for territory.

2. That other improvement of the same order which has substituted captivity for slavery, and exchange of prisoners for their murder in cold blood ; and, by so doing, has led men to fight less fiercely, and to yield when obviously defeated.

3. All those inventions that have issued in the substitution of missiles for hand to hand combat, and especially the invention of gunpowder, which by shrouding fleets and armies in a canopy of smoke, has gone far, if not to abolish, at least to diminish angry and destructive personal conflicts.

4. The progressive improvement in the health and physical condition of the communities from among whom soldiers and sailors have been recruited.

5. And lastly : discoveries and inventions directly applicable to the wounded and the sick.

Of these causes of amelioration in the state of warfare, as destructive of life, the fourth and fifth properly belong to the subject of these lectures. I shall, therefore, treat of them in their order, beginning with the improved health of the communities which feed armies and fleets with their living armaments—with men and with horses ; for what is true of soldiers and sailors will hold good, in its degree, of the animals that play so important a part in military operations.

In treating the first of these two topics—the ameliorations following on the improved health of the communities from which the supply of fighting men is drawn, I shall content myself with our experience here in England, taking the year 1815 as the limit of my inquiry ; and as my starting point, the middle of the fourteenth century : or the year 1346, when Edward III. invaded France,

and won the great battle of Crecy, besieging and taking Calais (in the year following). This battle of Crecy, and this date (1346) are points of special interest; for it is alleged that then artillery was used for the first time in the field; and two years later (in 1348), the terrible Black Death invaded us, inflicting the greatest loss of life which we have ever suffered. This terrible pestilence, too, furnished us within the limits of these islands, with one of our earliest lessons on the contingent miseries entailed by war. The Scots are stated to have been free from the Black Death till they made an irruption into English territory. They were unsuccessful, and carried back with them into their own country defeat and the plague. Their army was nearly destroyed by the sword and the pestilence together, and the civil population was infected by those who escaped. At so heavy and so unexpected a cost have nations purchased the luxury of invading the territories of their neighbours.

I need not tell you that this is no solitary instance of the mischievous agency of armies in conveying pestilences from place to place, and from country to country. The Sweating Sickness of 1485, appears to have originated with the army of freebooters and mercenaries who fought at Bosworth Field; the Petechial fever, five years later, decimated the Spanish army of Ferdinand the Catholic; the fourth attack of Sweating Sickness, in 1528, coincided in point of time with great military operations in Italy, where the Petechial fever raged among the French and their allies at the disastrous siege of Naples; and it was this fever that attacked the Imperial troops in 1547, and the Hungarians in 1566. Indeed, throughout this 16th century, the gathering and disbanding of mercenary troops was the acknowledged means of generating and dispersing more than one fatal pestilence in England and throughout the continent of Europe; and it is most

probable that the 700 deaths that took place in the squadron of Sir Francis Drake, in 1585, and which were ascribed for the most part to the fevers known as Calentures, were instances of disease carried by landmen to sailors at sea. We have an undoubted instance of such infection of fleet by fleet, in the fever which the victors of the 1st of June took from the crews of the captured French vessels, as described at length in my tenth lecture. Since that fatal 16th century, the production and spread of disease by means of masses of armed men has come to be an event less and less common; and this great sanitary improvement certainly kept pace with the growing immunity from the worst forms of pestilence among the nations from whom the fighting men were drawn.

Accordingly, the Plague, which paid us its first registered visit in 1593, and its last in 1665, is traced to the operations of commerce, not to the movements of armies.

The Plague, which gradually died out and disappeared from the Bills of Mortality in the few years following the great fire of London, was the last of that series of imported pestilences which began with the Black Death (doubtless an aggravated and modified form of the Oriental Plague); and its final disappearance marks a point of time in our sanitary history when the manners and habits of the people had so far improved as no longer to offer a welcome to these dangerous visitors. In this immunity of our civil population the army and navy certainly participated, as they had previously shared its dangers.

What the habits and manners of our ancestors were in the times of our destructive imported pestilences we all know. Of the places in which men lived and congregated it is scarcely an exaggeration to say that their houses were sties and their towns farm-yards; and that

their clothes and persons, and manners and customs, were in keeping with the state of the places they lived in. The letters of Erasmus,* written in the days of Cardinal Wolsey, in harmony, as they are, with earlier and later accounts, fully justify these statements; and the slow and gradual way in which our ancestors emancipated themselves from this thralldom of filth is quite faithfully set forth in the witty words of Sydney Smith, who asserts that "all degrees of nations begin with living in pigsties;" that "the king or the priest first gets out of them, then the noble, then the pauper, in proportion as each class becomes more and more opulent;" that "better tastes arise from better circumstances, the luxury of one period being the wretchedness and poverty of another."

And this principle of gradual extension of physical improvements from class to class doubtless prevailed in respect of the introduction and diffusion of all those aids to health which from time to time agriculture, manufactures, and commerce have bestowed upon us. It was little by little that the salt meats which Erasmus spoke of as constituting so large a part of our English dietary got replaced by fresh meat; that wheaten bread took the place of rye; that vegetables became common articles of food; that the culture of the potato spread from country to country and place to place; that tobacco, in spite of obvious objections to its use, came to replace, to some extent at least, the strong malt liquors and ardent spirits in which our ancestors so freely indulged; and that tea, coffee, and chocolate entered into a still more effective and most wholesome competition with those prolific sources of disease. What is true of shelter and food holds good also of clothing and personal cleanliness. It was by

* See "Public Health," Part I., Lecture III., p. 71.

slow degrees that articles of linen and cotton came into use as clothing worn next the skin, easily cleansed and readily changed : and that soap, soda, and potash found their way into every household as abstergents. By similar slow degrees must such valuable remedies as lemon-juice, bark, opium, mercury, antimony, and arsenic have had their virtues recognised, and so come into general use. The seventeenth century witnessed, I need scarcely remind you, the introduction and extension among the people, of several of these aids to health and remedies against disease ; and it was also the epoch of at least one great reform in the treatment of the sick, especially of that greatest of all innovations, the substitution of the *cool regimen* for the *hot*.

Such wholesome influences as these, constantly at work during the seventeenth century, spreading from class to class, from place to place, from person to person, cannot but have had a marked effect on the health of the community at large, and of the soldiers and sailors taken from among them ; so that the dawn of the eighteenth century must have witnessed a condition of things greatly in advance of that which prevailed at any previous period of our history. Perhaps the *seventeenth* century might be singled out as the age of unconscious and incidental sanitary improvements, and the *eighteenth* of conscious and sustained efforts in the same direction. We now know how much need there was of such efforts, as well as the direct bearing which those efforts had on the health of our soldiers and sailors, the efficiency of our armies and fleets. So that the period of the great war which occupied the last years of the eighteenth and the first of the nineteenth century may claim to be the most suitable of all epochs for the treatment of war in its sanitary aspects.

The conscious and sustained efforts of which I am speak-

ing were carried on chiefly by Captain Cook, John Howard, and Edward Jenner ; to which names I may add those of Sir George Baker, who found out the true cause of the Colic ; of Sutton and others who worked at the practical matter of ventilation ; of Brocklesby, who made some capital experiments on extemporized military hospitals ; of Lind, Blane, and Trotter who threw so much light on the diseases of seamen ; of Pringle, Jackson, Fellowes, and others, who conferred similar benefits on soldiers. Of this class of efforts and inquiries, the one that requires special notice in this place, as having first effected an immense improvement in the health of our civil population, and then, both indirectly and directly, in that of our soldiers and sailors, is the one which John Howard undertook, and carried to so successful an issue in the prisons of England. There are few things in history more surprising than the fact that our prisons should have continued in the state in which Howard found them to so late a date as 1773, when he was happily appointed sheriff of Bedford.* I have already, in the lectures to which I have referred, treated this subject of Howard's labours, discoveries, and reforms so fully that I must here content myself with stating that the prisons of England were a perennial source of that old pestilence, the Jail-distemper, which had so often invaded our courts of law, at the Black Assizes ; which was continually infecting our civil population by means of discharged debtors and criminals, and through the recruits taken from the same degraded classes, our armies and our fleets. It is, therefore, simply impossible to estimate the value of this great work of Howard's, the cleansing and reforming of the prisons of England. The nearly con-

* See "Public Health," Part I., Lecture I., p. 23, and Lecture VII., *passim*.

temporary labours of Captain Cook had more direct and exclusive bearing on the health of seamen, whether engaged in commerce or war ; and the great discovery of Jenner, somewhat later in point of time, so far resembled Howard's work that it affected our soldiers and sailors both indirectly, through the people at large, and by direct application to themselves. Of Sir George Baker's earlier discovery of the true cause of the Devonshire Colic, it is obvious to remark that its indirect results, as working through the population of one county, and its direct results as bearing on those sailors to whom Huxham and others recommended the cyder of Devonshire as a preventive and cure of scurvy, must have been very small indeed when compared with those great sanitary labours and discoveries which have immortalized the names of Cook, Howard, and Jenner.

When I tried in my earlier lectures to do justice to the sanitary reforms of the 18th century, and especially to the labours of those whose names I have just mentioned, I omitted to notice as they deserve the striking facts bearing on the use of cheap extempore and temporary hospitals, for which we are indebted to that intelligent army physician, Dr. Brocklesby. If I ask leave of you to repair that omission now, it is partly because the subject of the erection of such hospitals is one of special and growing interest at this time, not to soldiers only but to the whole civil population. This is a condensed account of Dr. Brocklesby's experiences.

In the year 1758, we made an unprosperous attack on the coast of France, and brought home a great many sick soldiers, who were lodged in old houses, barns, &c., round Newport, in the Isle of Wight. In one of these close hovels, a poor soldier of the 63rd Regiment, just landed from a transport, was placed. He was soon seized with malignant sore-throat, which carried him off

on the third day. Another soldier, who was placed in the same bed (the sheets only being changed) was speedily attacked in the same way, and soon died. A third man was put into the same bed and shared the same fate. "Fresh bedding of every sort" was now ordered, and "the boards all around" were scraped and thoroughly washed with vinegar, and then a fourth soldier was lodged in this hovel and died. A second time this "ill-fated spot underwent a most rational purification" with abundance of vinegar fumes, burnt gunpowder, and burnt resins, and all the contiguous parts were scraped, washed, and fumigated. But, in spite of all this precaution, a fifth man was attacked and had a narrow escape of his life. Having thus lost four brave men, and "with difficulty saved the fifth," Dr. Brocklesby would not suffer another soldier to be lodged in this place till after seven or eight days ; but a sixth soldier, having then been placed there, he too caught the disease, and had a narrow escape. Taught by this sad experience, and finding that the soldiers landed from the transports were more numerous than could be accommodated in all the spare out-houses, barns, and empty cottages which money could procure, or humanity supply, it was resolved to erect a temporary shed with deal boards, upon the open forest, to thatch it with a coat of new straw, thick enough to keep out wind and rain, and to make it large enough for 120 patients. A country workman did the work (charging for the use of the boards) for 40*l*. Here I quote Dr. Brocklesby's words :—"Although the hovel was finished in a fashion the most slovenly, and apparently inadequate to the end proposed, upon trial it was found, that notwithstanding much extraordinary cold as well as moisture which the sick there lodged had suffered, remarkably fewer died of the same diseases, though treated with the same medicines and the same general regimen, than died anywhere

else ; and all the convalescents recovered much sooner than they did in any of the warmer and closer huts and barns hired round Newport, where fires and apparently better accommodation of every sort could be provided for them."

Now this striking fact happened to come to the knowledge of Mr. Adair, Inspector of Regimental Infirmaries, who was in the neighbourhood, and he, " remarking that this currency of fresh air had such amazing salutary effects upon the men hutted in the forest, procured an order to convert Carisbrooke Castle itself, situated upon the extremity of a very high ridge of land, into one large general hospital, where near 400 sick might, on occasion, be lodged together."

" At first," says Dr. Brocklesby, " it was expected that the sick brought to that place would do better than their comrades who were lodged up and down in the miserable huts of the town, or than those upon the wild bare forest near Newport, under that occasional hovel" (meaning the 40th. extempore hospital). " Yet the event verified our conjectures only in part, for though the castle was more prosperous to their recovery than the small rooms in low-roofed houses, yet more, proportionally, of the foresters were recovered, and that much sooner than any of the rest ; and it evidently appeared that all the damage and inconvenience the men suffered from cold or redundant moisture in that place, was much fitter to be tolerated on the whole than the mischiefs complicated on the sick by huddling together 300 or 400 men and upwards, under one roof, and in the out-houses adjoining to the castle."

But Dr. Brocklesby has still something to tell us about cheap extemporized hospitals and their good effects ; for two years later (1760) a dangerous putrid fever made its appearance amongst the sick of the 30th Regiment, at

Guildford, in Surrey, which led him to erect other hospitals, with like good results, and at the reduced cost of something above 10*l.* a-piece.

The sick soldiers were at first taken to their infirmary about five miles from the camp. As this place was crowded with more than four times the number it ought to have contained, Dr. Brocklesby remonstrated, and obtained from General Cornwallis plenary powers to act. It was "in the beginning of September, 1760, when very unusual numbers from the 30th Regiment," and a few from other regiments, "were daily falling sick of putrid petechial fevers, and when proper accommodations for the sick could by no means be procured in the town of Guildford, that the doctor made his second experiment.

He "pitched upon the dryest and most airy spot," on a rising ground in a field behind the camp; hollowed out as much of the dry sandy soil as he required, and near the edge of the hollowed ground drove in upright stakes, about six feet high from the surface, and placed wattles between them, coated on the side next the weather with fresh straw. Rafters were laid over in a workman-like manner, and coated thick like the sides. This made the hollow "spacious and airy over head, and yet abundantly warm and dry."

This structure cost the public ten guineas, added to 5*l.* for straw, and gratuities to the bricklayers, who built a large chimney and set a kitchen-grate. So that probably this hospital, for forty patients, did not cost more, from first to last, than 20*l.* Now Dr. Brocklesby tells us "that though several soldiers were admitted into this 'repository,' ill of a true petechial jail-fever, only one or two, at most, died in it;" and he adds, "I candidly ascribe their fortunate escape more to the benefit of a pure, keen air they breathed therein every moment than to all the medicines they took every six hours or oftener. For on

account of the nature of this sandy soil, there was an opportunity to remove, as oft as necessary, the whole inner surface of the floors and walls, which might be suspected to imbibe and retain any infectious matter proceeding from the patients ; and the sand so scraped off was, every three or four days, ordered to be thrown out of doors."

Dr. Brocklesby had still another and another opportunity of trying this happy expedient of cheap extemporized hospitals, in 1761 and 1762. In the first of these years there was a militia camp at Winchester, and much sickness there. The soil was chalk ; and he proceeded to dig three pits, thirty-one feet long, nineteen wide, and five deep ; at a foot from the edge of these pits he drove stakes, six feet apart, formed his walls with wattles and thatch, and his roof of the same materials. A brick chimney, and boards fastened along the line of the men's heads, completed these "mansions for the sick." Air-holes in the thatch, to be occasionally opened, served as windows and ventilating apertures ; and steps, cut in the chalk, gave access to the interior. To these three mansions the fever cases from the "close infirmary at Winchester, as well as from the camp," were admitted ; and, in less than a fortnight, the numbers were reduced in the proportion of four to one, the number of sick to the end of the campaign were much fewer than ever before, and all the men admitted, "except three at most," were cured. The following year, 1762, the same plan was adopted on the chalky soil of a different encampment, a large, airy porch being added before each door. A regiment encamped there lost not a man during the whole encampment ; while "Some other regiments of the brigade, who had invincible prejudices against the above practice, lost several of their sick in that and the previous year. And all that time," says the worthy

doctor, "the militia themselves were known to give ten guineas, or more, for a good recruit to supply the place of the deceased."

This abstract of Dr. Brocklesby's experiences with cheap extemporized hospitals I have laid before you as both instructive and suggestive—as equally applicable to war and peace, and as bearing directly on one of the most important hygienic questions of the day. His facts are in perfect harmony with Sir George Baker's interesting narrative of the outbreak of small-pox at Blandford, when patients in natural small-pox fared better under hedges and dry arches than those who had been inoculated did in their own dwellings.*

In treating of the conscious and sustained efforts of the 18th century, in the direction of sanitary improvement, and especially of these experiences of Dr. Brocklesby, I have almost insensibly encroached on the second topic to which I proposed to address myself. I mean the discoveries and inventions directly applicable to the wounded and the sick. With a view of giving completeness to this branch of my subject, I have made some attempts to ascertain the order and dates of those surgical inventions, such as the tourniquet and the trephine, which are specially applicable to injuries received on the field of battle, or during naval engagements. But I was obliged to content myself with the scanty information that inventions of this order are of very ancient date, though some improvements, such as Petit's substitution of the screw for the stick in the tourniquet, may be traced to those who first proposed them. Nor do we know how that "fear of hæmorrhage," which, as Samuel Cooper expresses it, "retarded the improvement of our profession for ages," was gradually overcome; or who it

* See "Public Health," Part I., Lecture I., p. 16.

was that first dared to amputate a limb, without waiting till mortification had set in ; or when and by whom the knife was first used to supersede the burning irons and tight ligatures of the older surgery. Even that capital improvement, the use of the ligature to bleeding vessels, which Ambroise Paré introduced into practice, he himself traces back, as a suggestion, to Celsus and Galen ; as an invention, to the inspiration of the gods.

But whatever the uncertainty that hangs over the authorship and date of the more important surgical instruments and methods of treatment, it does not admit of doubt that the middle of the 16th century (say from 1536 to 1569, when Ambroise Paré served with the armies of France, or some years later, when Thomas Gale and John Woodall were gaining experience of military surgery here, in England), was a very important epoch for all fighting men. The ligature, which the older writers had recommended, and Paré's predecessor, as a great surgical authority, John de Vigo, had distinctly described, Paré used systematically and constantly. But he earned another title to the affectionate regard of all men suffering from gunshot wounds. For he was the first to discover the fallacy, so fruitful of suffering, which had condemned men so wounded to the torture of boiling oil. As this discovery of Ambroise Paré, and the important reform to which it led, is both instructive in itself and typical of the many improvements in the practice of our art that have consisted in abstinence from some mischievous interference dictated by science falsely so called, I shall make no apology for detaining you while I give a brief account of it. It is Paré's own history, done into English by one Thomas Johnson, who published a translation of his collected works, with many misgivings and apologies, in 1634.

When Ambroise Paré, then about thirty years of age,

had his first experience of war, one John de Vigo, surgeon to Pope Julius II., seems to have been as much an oracle in surgery as the Pope himself was in religion. Now this John de Vigo, in his work published early in the 16th century (our College Edition of it is dated 1514), in treating of wounds, classes those made by gunshot with bites of serpents and other like injuries, as being poisoned ; and prescribes for the whole class a treatment by boiling oil.

Now it happened that Paré, in the year 1536, was serving with a French army in Italy, that had just fought a battle, in which there were many wounded on both sides, with all sorts of weapons, but chiefly with bullets ; and our surgeon honestly confesses that at that time he was not very expert in matters of chirurgery, nor used to dress wounds made by gunshot. But he had read in John de Vigo, that wounds made by gunshot were venenate or poisoned, and *that* by reason of the gunpowder ; wherefore for their cure it was expedient to burn or cauterise them with oil of elders scalding hot, and a little treacle mixed therewith. But Paré was a sceptic, and gave no credit to the author or his remedy ; for he knew that caustics could not be poured into wounds without excessive pain. Still he would run no risk ; and determined to ascertain whether the chirurgeons who were with him in the army used any other manner of dressing to these wounds. But he saw that they all used that method of dressing which Vigo prescribed, and filled as full as they could the wounds made by gunshot, with tents and pledgets dipped in this scalding oil at the first dressing. This encouraged Paré to do the like to those who came to be dressed of him. But it chanced on a time, that by reason of the multitude that were hurt, he wanted this oil ; and because there were some few left to be dressed, he was forced, that

he might seem to want nothing, and that he might not leave them undressed, to apply a digestive made of the yelk of an egg, oil of roses, and turpentine. But Paré could not sleep all that night. His mind was ill at ease ; the dressing of the precedent day, which he judged unfit, troubled his thoughts ; and he feared that the next day he should find them dead, or at the point of death by the poison of the wounds, whom he had not dressed with the scalding oil. Therefore, he rose early in the morning to visit his patients, and found beyond expectation such as he had dressed with a digestive only, free from vehemency of pain, to have had good rest, and that their wounds were not inflamed or tumefied ; but, on the contrary, the others that were burnt with the scalding oil were feverish, tormented with much pain, and the parts about their wounds were swollen. When he had many times tried this better treatment in divers others, Paré thought thus much, that neither he nor any other, should ever cauterise any wounded with gunshot.

But the history of this most interesting discovery and reform in surgical treatment is not yet complete. It connects itself with a secret remedy very famous in those days. I mean the *oleum catellorum*, or oil of whelps, of which this is a true account. "When," says Ambroise Paré, "we first came to Turin, there was a chirurgéon far more famous than all the rest in artificially and happily curing wounds made by gunshot ; wherefore I laboured with all diligence for two years' time, to gain his favour and love, so that at length I might learn of him what kind of medicine that was which he honoured with the glorious title of balsam, which was so highly esteemed by him, and so happy and successful to his patients ; yet could I not obtain it. It fell out a small while after, that the Marshal of Montejan, the King's Lieutenant-general then in Piedmont, died ; where-

fore I went unto my chirurgion, and told him that I could take no pleasure in living there, the favourer and Mæcenas of my studies being taken away ; and that I intended forthwith to return to Paris, and that it would neither hinder nor discredit him to teach his remedy to me, who should be so remote from him. When he heard this he made no delay, but presently wished me to provide two whelps, one pound of earth-worms, two pounds of oil of lilies, six ounces of Venice turpentine, and one ounce of aqua vitæ. In my presence he boiled the whelps, put alive into that oil, until the flesh came from the bones ; then presently he put in the worms, which he had first killed in white wine, that they might be so cleansed from the earthly dross with which they are usually replete ; and then he boiled them in the same oil so long till they became dry, and had spent all their juice therein ; then he strained it through a towel without much pressing ; and added the turpentine to it, and lastly, aqua vitæ ; calling God to witness that he had no other balsam wherewith to cure wounds made with gunshot, and bring them to suppuration. Thus he sent me away, as rewarded with a most precious gift, requesting me to keep it as a great secret, and not to reveal it to any.

If I had time, I should like to make this singular history the text for many an instructive comment ; but I cannot refrain from pointing out the curious psychological phenomenon presented by the great French surgeon. His mind was too acute not to suspect the mistake his contemporaries made in following De Vigo's precepts, and adding the tortures of scalding to the pain of gunshot wounds ; and yet something or other in his mental composition and habits of thought withheld him from recognising in this oily slime the negative virtue of his own extempore compound of yelk of egg, oil of roses, and turpentine. Perhaps it was the two long years spent in

gaining the favour and love of the inventor ; perhaps the superstitious belief, from which even a Paré could not free himself, that the principle of life might be transferred in some mysterious manner from the poor whelps and earth-worms to the fluids in which their lives were extinguished.

Next in order of time, and greater in practical importance, among the discoveries which have tended to ameliorate the lot of fighting men, the military historian would have to note the good service rendered by John Woodall, the author of the "Surgeon's Mate."

This able and experienced master of chirurgery, in a treatise on the scurvy, which, if we set aside the first words of his definition, to wit, that it is a "disease of the spleen," would scarcely discredit an author of our own day, sets forth the juice of lemons, limes, oranges, and tamarinds, but especially the juice of the lemon, as the true remedy for the disease. Nor was this merely a speculative opinion of his ; for he tells us that at the time at which he wrote (1617) there was "a good quantity of juice of lemons sent in each ship out of England by the great care of the merchants." He commends it as "a precious medicine and well tried," prescribes two or three spoonfuls of it every morning fasting, with a little at night, and as an addition to each purge ; and he heartily approves the use some surgeons made of it as a preservative. This real remedy, preventive and curative, seems to have fallen into disuse in later times ; and it was not till about two centuries later (in 1796) that it was ordered to be regularly served out to the crews of our ships of war.

Lemon-juice was the first of those remedies, of which we have so few, that are not only curative, but also preventive, and which (unlike mercury, arsenic, antimony, opium, and the lancet) scarcely admit of being used in

excess or misapplied. The second remedy of the same class, brought into use in this same seventeenth century, but about fifty years later, is of special interest to our soldiers and sailors ; I mean cinchona bark and its alkaloid, quinine. Need I remind you that, in this century also, and about the same time that we first made acquaintance with the Jesuits' bark, coffee, chocolate, and tea gradually came into use ; or that the potato, the boon of the previous century, the most portable and storeable of our antiscorbutic vegetables, and tobacco, the solace of all fighting men, another boon of that century, were coming into general use among all classes of the population. Our fighting men were also greatly interested in that great reform in treatment due to John Crane, of Cambridge, practising there about the middle of the sixteenth century, but which Sydenham revived and succeeded in establishing, I mean the "*cool regimen*."

These were the good gifts of the seventeenth century to our soldiers and sailors, as well as to the people at large. To the eighteenth century we owe the boon of *inoculation* (an unmixed blessing to the soldier and sailor, though open to obvious objection when applied to society at large) ; important experiments and inventions bearing on the *ventilation* of ships, prisons, barracks, and hospitals ; Sir George Baker's fruitful discovery of the cause of colic ; Captain Cook's demonstrations of the possibility of preserving the health of sailors in long voyages ; Howard's grand prison reforms ; and Jenner's gift of vaccination.

In addition to these more comprehensive sanitary improvements, which affected alike our civil population and our fighting men, there were special reforms that were brought to bear during this eighteenth century on the navy and army. Those that addressed themselves to the health of the navy are mentioned in some detail by Sir

Gilbert Blane. It was in 1761 that that great structural improvement, copper-sheathing, was introduced ; in 1781 that small tenders and receiving ships were superseded by those better vessels known as *slop-ships*, from which recruits and pressed men were passed into the service in a cleanly and healthy condition ; and still later in the century that much needed improvements were made in "the situation, fitting, and furniture of the *sick-berth*." It was not till the fourth year of the war (1796) that lemon-juice was fully introduced into the navy, and the naval surgeon was no longer required to furnish medicines at his own cost. It was probably in this year, too, that the better regulations respecting syphilis, alluded to in my tenth lecture, were brought into play.

Sir Gilbert Blane also alludes to measures for cleansing and drying ships ; to personal inspections at stated periods, to ensure cleanliness ; to the separation of the sick from the sound ; to measures for maintaining the purity of the water ; the substitution of wine and tea for spirits ; and the use of preserved meats, as wholesome appliances brought into use towards the end of the eighteenth century. I have elsewhere shown how effectual were these measures, supplementing the more comprehensive and far-reaching sanitary discoveries and reforms already referred to, in improving the health and increasing the efficiency of the navy. I reproduce some of the figures I have already quoted.* They show the number of sick in five years of the war in which the seamen and marines voted by Parliament were 120,000. The sick were 20,544 in 1797, 15,713 in 1798, 14,608 in 1799 ; then after the lapse of six years, 8083 in 1805, and 7662 in 1806. The two years of the war in which

* See "Public Health," Part I., Lecture I., p. 24, and Lecture VI., p. 163.

the parliamentary vote was for 100,000 seamen and marines, gave similar results—in 1795, 22,909 sick, in 1804, 7650—less than one-third.

All the great sanitary reforms and inventions of the eighteenth century doubtless had their effect, both indirect and direct, upon the army ; but I believe that I am justified in stating that no considerable or well-defined sanitary improvements and reforms were introduced into the military service during the war that ended in 1815. They belong to a later period, and may be reserved for some future opportunity. In saying this I am not unmindful of the services rendered by Robert Jackson to the army by the works which he published within a few years of the outbreak of the war—works which abound in valuable suggestions based on his own experience, especially in warm climates, and supported by many a learned reference to earlier writers. But taking all things into account, it is obvious that we entered on our great contest with France, and the nations which she first conquered and then arrayed against us, with advantages such as we had enjoyed in no previous war ; and we were still to profit, at least during the latter part of the struggle, by the substitution of vaccination for inoculation. And had we been quite true to ourselves, had the Government from the very first availed itself of all the knowledge that had been placed at its disposal ; if fever could no longer be imported from our jails, or small-pox from our naval hospitals ; had the lessons taught us by Howard, Sir George Baker, Brocklesby, Jackson, and many others, respecting overcrowding and its manifold mischiefs, been duly appreciated and acted on ; had lemon-juice been supplied to our navy from the first ; had bark been largely administered as a preventive whenever, as at Walcheren and in the Peninsula, ague and remittent fever showed themselves ; had intemperance

been discouraged to the utmost—in a word, if Government had but known and felt all that health is to armies and fleets, all that disease can do to defeat the best plans of the most skilful commanders, it is hard to say what thousands of men and millions of money might not have been saved, what failures averted, what grand successes achieved. But we wasted our strength over and over again in the early years of the war, in ill-advised co-operations with French emigrés, as at Toulon and Quiberon, got entangled with Austria in the meshes of her obstructive Aulic Council, threw men and money with lavish hand into the greedy swamps of Holland, and when we had found out that the right road to France lay through Portugal and Spain, and knew that Wellington was the man who could lead us through it, we withheld the needful supplies of men and material, emulating in this respect the strange example of the haughty, jealous, and perverse Spaniard, who seems to have found it more easy to forgive the treacherous and cruel foe for robbing and oppressing him, than the generous friend for lavishing blood and treasure in his defence.

But I must not detain you much longer—only long enough to express a hope that I have not wholly failed in my treatment of that episode in the sanitary history of England which consists in the war with revolutionary and imperial France. I shall not have failed if I have left upon your minds the impression which is so strong upon my own, that of all the losses inflicted by war the greatest and the worst are those which the soldier and sailor share with the civilian, in the shape of health and life needlessly sacrificed by neglect of sanitary precautions; that to have a healthy army and navy they must be recruited from a healthy home population, and be followed by land and sea with a care and solicitude equal at least to that which we bestow on our civil population.

A nation of only thirty-two millions, with a vast manufacturing industry, a most busy and flourishing commerce, an Indian Empire to govern and retain, colonies to attract the most vigorous and enterprising of our people, great fortresses to man and defend, cannot afford to waste the lives of its citizens, much less of those whom it has first selected to fight its battles and then submitted to a costly course of training, for the perilous work they have to do.

Throughout the long war with France one thing alone never failed us—the indomitable courage of our fighting men. Fifty-eight years of subsequent experience has done nothing to lessen our confidence in them. The men who scaled the heights of the Alma, held the ridge of Inkermann, and charged into the valley of Balaclava, were made of the same stout stuff as those who, nearly half a century before, hurled the veterans of France from the hill of Albuera, fought and won the battle of Corunna, drove the French out of Egypt, did not disgrace themselves even at New Orleans, and gave peace to Europe at Waterloo.

But alas! the perverse folly that planned the Walcheren expedition, and the mismanagement that tortured Wellington in Portugal and Spain, proved itself perennial in the Crimea. And we who look back to these events, and forward to possible wars (maybe with the Power that has just humbled France), are forced to ask ourselves these questions:—Will the soldier prove as true to his traditional courage as the State to its precedent of bad management and ill-placed economy? Will our sailors, amid the inevitable revolution in naval warfare, assert their old superiority? I think that I see a sufficient answer to these questions in the *Birkenhead* sinking into the sea with her noble crew of disciplined soldiers mustered on deck as if on parade; and in the examples,

more numerous than I can mention, of manly and chivalrous self-sacrifice, when commander and crew alike, having rescued women and children, think for the first time of their own safety. Burgoyne, on board the *Captain*, Knowles, on the deck of the *Northfleet*, prove that heroic courage and calm self-possession in men standing in full consciousness of all that it means to be on the very brink of destruction, are still the attributes of the English fighting man.

One consideration there is that must make us all hopeful of the future of England. The sea is for us a perennial source of courage and hardihood, of enterprise and adroitness; the highway to all lands; the element on which war may be waged with least loss of life; so that, England, with her comparatively small population, need not fear defeat from lack of seamen. May we not hope too, that the example of our successful campaign in Abyssinia will have taught us the precious lesson that England's true policy in all future wars is to seek a firm base of operations on the coast, whence to advance with all the aids of sanitary science and constructive skill to the most vital point of land attack? If ever again we seek hostile armies in the heart of broad continents, tempt defeat in swamps, or consent to fight side by side with the most promising of allies, we must have forgotten or ignored all that these lectures have taught about the great war with revolutionary France. We shall have deserved to fail as at Toulon, in Holland, at Walcheren, at New Orleans; and we shall need something more than the skill of a Wellington to repeat the successes of the Peninsula.



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